STAFF WORKSHOP ON

DEVELOPMENT OF

FIVE-YEAR TRANSMISSION RESEARCH AND

DEVELOPMENT PLAN

BEFORE THE

CALIFORNIA ENERGY COMMISSION

RESEARCH AND DEVELOPMENT COMMITTEE

In the Matter of:	)	
	)	Docket No.
CALIFORNIA ENERGY COMMISSION	)	
RESEARCH AND DEVELOPMENT	)	
COMMITTEE WORKSHOP	)	
PIER DEVELOPMENT OF FIVE-YEAR	)	
TRANSMISSION R&D PLAN	)	
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CALIFORNIA ENERGY COMMISSION

HEARING ROOM A

1516 NINTH STREET

SACRAMENTO, CALIFORNIA

WEDNESDAY, MARCH 12, 2003

9:43 A.M.

Reported by:
Peter Petty
Contract No. 150-01-005

COMMITTEE MEMBERS AND ADVISORS PRESENT

Arthur Rosenfeld, Presiding Member, R&D Committee
John Geesman, Associate Member, R&D Committee

STAFF PRESENT

Linda Kelly, Transmission Program Manager

Laurie ten Hope, ESI Team Leader

Jamie Patterson, Assoc. Electrical Engineer

STAFF CONSULTANTS

Joseph H. Eto, Lawrence Berkeley National Laboratory

Robert Shelton, Navigant

Peter Mackin, Navigant

ALSO PRESENT

Joseph Mollure, Kinectrics

Dave Hawkins, California ISO

Manuel Alvarez, Southern California Edison

Henry W. "Hank" Zaininger, Zaininger Engineering Company

Jan Sharpless, Industry Consultant

Syed Ahmed, Southern California Edison

Thomas D. O'Connor, O'Connor Consulting Services Inc.

Richard Lordan, EPRI

William H. Myers, The Valley Group

John Minnicucci, Southern California Edison

James Corlett, SDG&E

R. Al Figueroa, ESC Consulting

ALSO PRESENT CONTINUED

William Torre, SDG&E

Peter Evans

George D. Rodriguez, Southern California Edison

Richard Hammond, Optimal

C. Tim Wu, City of Los Angeles Department of Water and Power

Randy Hopkins, PG&E

Stephen Lee, EPRI

Katie McCormack, Center for Resource Solutions

Thomas R. Mclane, ATC

Richard Counihan, Electricity Innovation Institute

I N D E X

P R O C E E D I N G S

9:43 a.m.

ASSOCIATE COMMITTEE MEMBER GEESMAN: If people could take their seats.

This is a workshop of the Commission's R&D Committee. Mr. Rosenfeld is the Presiding Member, I'm the Associate Member. Because of my particular interest in transmission, Commissioner Rosenfeld has graciously given me the responsibility of reading the opening script. I would encourage people to feel that these words have been chosen carefully by our staff.

The purpose of the Workshop today is to share with you the information developed in two consultant reports, as well as a proposal for implementation of the Commission's Transmission Research Plan.

Today we're here to solicit your input and stimulate dialog on these draft reports, as well as the research direction that you feel the Commission should take forward in the transmission area.

The Commission will use these reports as a foundation when developing the CEC Five-Year Transmission R&D Plan. So it is important that

you bring forward any questions, additions, or suggestions to refine or refute the information presented today during this Workshop.

Major transmission issues face California. The Energy Commission does not want to leave to chance the resolution of these critical issues. So we are going to develop a strategy and a research plan for going forward into the future.

Today we are here to listen to the members of the public and stakeholders on what transmission research will provide the highest priority public benefits and why. In the afternoon, Staff will present a proposal for implementing the Transmission R&D Plan.

I encourage you to ask questions and comment on this proposal. And I emphasize, it is only a proposal at this point. Any organization that feels which it has expertise that will be useful to the Commission as we implement our research plan are welcome to submit names, contact information and experience that you believe will be helpful to us.

The agenda for the Workshop is full, so I'd like to turn the meeting over to the Staff so

we can begin our presentations and discussions. Laurie.

MS. TEN-HOPE: I'm right here. Good morning, I'm Laurie ten-Hope, I am the Team Lead for the Energy Systems Integration Team of PIER. And I just want to provide a moment of context for the Workshop and what we're doing in the development of a transmission plan.

We do have a history funding PIER projects. And a foundation to build on for this transmission plan. We been funding transmission projects for five years. We have over 50 T&D related projects, at about 25 million dollars.

The majority of those projects, about 75 percent have been funded through my team, Energy Systems Integration. But we also have a significant effort in transmission in both the PIER Renewables Team and the PIER Environmental Team.

We have funded projects in a variety of topics, some of those include advanced conductors, seismic safety, intelligent software agents, tools for real time grid management, real time rating tools to increase the transfer capability of cables and many other projects.

Many of the researchers that we work with are here in the room. We have worked with utilities, consortiums, the national labs and private sector researchers. And we're glad that many of you came today and can talk with us about what you think some of the research priorities are in transmission going forward.

Though we think we have a healthy portfolio of projects and we have some history doing transmission, we thought as the program matured it was really important to step back and assess the projects that we have and what initiatives make the most sense going forward.

And really prioritize the areas where we think we'll be able to make the biggest difference to benefit California. And we also, in addition to re-assessing what we do and prioritizing the transmission issues.

We also wanted to take a look at how we do it and have a more formal process of engaging stakeholders in defining, or providing input on the issues, the opportunities and being able to collaborate across stakeholders and make sure that our results get into the marketplace.

What we're going to do today is, as the

Commissioner said, take comments on two draft consultant documents that will provide a foundation for the Energy Commission to develop a research plan.

So we're really interested in receiving your comments on these two reports. In addition, we are going to talk about what our Staff's proposed implementation strategy is for implementing the program. And we'll again be taking comments on that proposal as well.

I just want to give you a quick sense of what happens after the Workshop. We will be taking comments on what is discussed today until March 19th, so please submit any comments that you have. There was a contact sheet at the front and that has information on where to send your comments, basically to Linda Kelly that you will meet in a moment.

The two consultant reports will be finalized by mid-April. And then Staff will take the comments and the California transmission issues and these two documents, and from that will draft a Draft Research Plan for Transmission.

Parallel to the development of the plan, the R&D Committee will establish a budget for

transmission and other PIER activities. With that budget, we will finalize our transmission plan and expect to have that around the June, early summer time frame.

I'd like to now introduce Linda Kelly, Linda is the PIER Program Manager for Transmission and she is going to walk us through the day and introduce our morning speakers.

MS. KELLY: Thanks Laurie. Before I get started, I thought it would be important, there are always on a team, some key people that are behind the scenes that are really very important. And our team has a number of people that I just wanted to bring to your attention, because during the course of doing this Transmission Plan they will be integral to all the work that we're doing.

First, over here is Jamie Patterson, he is with the PIER Program and he is an electrical engineer. Next to him is Don Kondoleon, Don is not always behind the scenes, but he definitely is directing efforts with regards to transmission in our siting division.

And Demy BuCaneg, he is in the back there, Demy is another electrical engineer that adds to the expertise on our team and he works

with Don in his division. And one last person is Lloyd Cibulka, Lloyd, he has a lot of experience managing research programs. Worked with a utility and he has been working with us helping us develop this research assessment and has been a big help to us.

Just some business; this Workshop is being recorded. We want to make sure that we get all your comments and we understand all the input that you give to us. So that puts a certain amount of formality around these proceedings and I hope that won't interfere with your spontaneity, but I would have to remind you that every time you speak, that you should come up to the microphone, one of these microphones.

The first time you come, well, each time you come, I want you to say your name, because this is also being webcast, and so the people who are listening will not necessarily recognize who is speaking each time you speak. Come up to the microphone the first time and give your business card to the Workshop recorder over there.

If you don't have a business card when you have finished making your presentation, or making your comments, if you would just step aside

and give him spellings and any other information that you think will be useful to him.

With regard to running this Workshop, we have a pretty full agenda. And I'd like to not rush you, but keep things moving along. And so that what I'd like to do is when we have breaks for questions, what I am going to ask is, is that if we just get a show of hands of who would be interested in asking questions.

If there is just a few of you, then we won't worry and if we're not behind. If there is a lot of you, then I might ask that you limit your questions or your comments or at least keep them short and as concise as possible in the interest of keeping everything moving along.

We are planning, each of the two major presentations. There is a logical break. They will be presenting discussions about the methodology in the case of Navigant. And how the scenarios were developed in the case of Joe Eto.

And so what we will do, is that we'll take a break once we finish the basic discussions there and see if there are any clarifying questions. Then, they will continue their presentation and discuss the recommendations.

So, the first break will be for clarifying questions. Then, they will continue with their presentation and then we'll move on to the questions about their recommendations.

Now, back to the agenda. Last fall when we were planning to develop our Transmission Workshop, we recognized that we would have to have a comprehensive information about research and development that is currently going on.

We also realized that we would need some type of a tool to help us account for both regulatory and industry uncertainty. Clearly there is a lot of uncertainty in California and actually throughout the whole United States with regard to transmission, transmission ownership, transmission research, a whole range of issues.

In the course of trying to figure out how we would like to do this, I read the DOE Transmission Plan, and in that transmission plan they had done a number of white papers, and white papers, amongst those white papers was a scenario analysis that was done by CERTS, which I'll explain who they are.

I realized that if we were going to try to do a research plan, if we try to just look at

the issues today and figure out what research needed to be done, that tomorrow, we would probably -- that plan would be out of date and just not as relevant as the day before. That's how uncertain things are now and how quickly things are changing.

So looking at the DOE Scenario Analysis, which really gave the opportunity for DOE and the federal folks to look at how things would change, and how this would effect R&D, I decided to talk to Joe Eto. And what Joe did for us, is that he took and he developed four California scenarios, four future states, if you will.

None of these are a preferred scenario. We just want to begin to think if the world changes, as we know it will, what would happen and how would that effect our research plan and the R&D we were planning to do. So Joe developed those four possible future states and scenarios for us. And he look at, you know, how the California electricity system would be effected and how the transmission R&D would be effected by those changes.

One thing very critical to all the work that we've done, is I asked Joe, and I also asked

in the Navigant work that we did, is that they focus on prioritizing public interest R&D. We were interested in what R&D was done, but our focus was public interest R&D, so in both of these reports, we have asked them to focus their results on that type of R&D.

At the same time, we were doing this work with Joe Eto, we went and asked Navigant if they could help us do this research assessment. They put together a team of R&D industry experts. They went out into the field, asked questions, surveyed people and completed an assessment that we are going to discuss here today.

Once they finished the assessment, they also did a gap analysis. And again, I just really want to emphasize that when we look at, you know, what recommendations are coming out of these reports, we are focusing again on public interest R&D.

We're here today to present the draft findings from both these reports and get your input. Once we have your comments, which are due, as she said by 3/19/03, we'll finalize these reports and use them as tools and resources to develop our plan.

Now I want to just move on to the presenters, they have a lot of information. Our first presenter is Joe Eto, from Lawrence Berkeley National Laboratory. He and John Stovall from Oakridge National Laboratory developed and wrote the California Electricity System of the Future Scenario Analysis Report for us.

Joe leads the Consortium for Electric Liability Technology Solutions, that CERTS. I've finally gotten that straight. And has as its mission to research and develop and commercialize new methods and tools and technologies to protect and enhance reliability of the eclectic system.

They are also looking at helping the U.S. Government move into the competitive electricity market. Joe is here to explain how the scenarios we developed were developed and discuss how these R&D recommendations emerged from the work, Joe.

MR. ETO: Thank you very much Linda. Thank you Commissioners, Staff and Transmission R&D stakeholders. It is an honor and a pleasure to be here to talk to you about the work that we performed for the PIER Program to support them in their R&D planning.

Linda said most of the things I was going to say as introductory comments. So let me just highlight a couple of them. I'm a staff scientist and the Lawrence Berkeley National Laboratory. Most of my time is spent managing the program office for CERTS. Linda mentioned what the acronym stands for, members of the consortium include several of the National Laboratories, a consortium organized under the National Science Foundation itself, of Universities that do research in electrical engineering and market economics, as well as a number of industry partners.

And I will show you the website where you can go to learn more about CERTS and the work that we've been conducting on public interest R&D on electricity reliability needs that were essentially create by the transition to competitive electricity markets.

What I'm going to do today -- hold it, thank you. Let me summarize what I'm going to try to accomplish today. Really, the primary goal is to present the findings from our draft report, which was prepared in support of the PIER Transmission R&D planning activity. In doing so,

I'm going to review every element of the draft report, which I understand has been posted on the CEC's website and is available for review and comment.

I'm going to discuss the approach and the background for how we came to this idea of using scenarios to do R&D planning. I'm going to talk about the criteria that we were, excuse me, the technologies that were identified to be considered as part of what might be considered in a public interest R&D portfolio for transmission.

I'll talk about the criteria that were used to select from the large list of technologies that we considered to apply specifically for public interest firming types of activities. And then, I'll present the scenarios themselves. At that point, I'm going to take a break and I'm going to turn it over to Linda to facilitate a series of clarifying questions and discussions about the scenarios themselves.

Following that break, I will go back and present the R&D Assessment that we conducted based on those scenarios and then I'll identify the R&D priorities that we identified through applying this process.

At the end of my comments, I'll repeat a number of questions that were identified as the ones that we want to use to organize the discussion that follows. Again, I think Linda covered some of this background.

The CERTS Program is a contracted to the California Energy Commission PIER Program. We are conducting a reliability and R&D in a number of areas, both within the Transmission Program, but also for the Demand Response Program and also for the Distributed Energy Resources Program.

We also have a task to support strategic R&D planning, and it is from that task element that this work is emerging from. The focus of most of the work in the R&D planning activity in the actual R&D execution activity has been in a very fortunate partnership with the California ISO and the Department of Energy to try and leverage Department of Energy Resources to solve some real problems that the ISO has with some new software tools.

And Dave Hawkins is here, I'm sure he can talk about the things we've been doing in that regard. The background again for this study, Linda has already mentioned this, as we did a

series of white papers for the U.S. Department of Energy to help them think about transmission planning for their program and among those papers was a scenario analysis looking at future states of the national electricity industry as a way of thinking where R&D priorities might sit in that.

And let me just take a step back and repeat something that Linda, I think, began to touch on, which is the future is very uncertain, particularly at this time, perhaps more so than any other time in this industry's past. And the kinds of planning that are appropriate, I think need to reflect that uncertainty.

And so traditional approaches to uncertainty analysis, sensitivity analysis. You know, in some sense you can use some of the way, but not all of the way. And we have found scenario planning, scenario approaches, in where you postulate logically consistent future states of the world and uncover the logic that holds them together for how you might want to evolve a particular planning objective to be a very, very powerful way, not so much from, you know both the results, but also the process of scenario development.

In that regard we were very fortunate to have an opportunity to preview many of the scenarios that I'll be talking with you about at a Workshop that the Commission held internally, to talk about what kinds of futures are worth considering the kinds of R&D that PIER might be undertaking. So specifically, we developed these California specific scenarios and I'll be walking through the process in the next few slides.

The website as one of my careful readers has pointed out has a typo in it, there is a slash following the word CERTS, which apparently in this color is very hard to see anyway between CERTS. It's certs.lbl.gov if you want to look at the website for the consortium to look at some of the other research that we're doing and some of the publications that we've put together.

So let's talk about the approach for the project overall. Essentially what we're going to do, this looks like a very linear process, but I am actually going to present it in quite a different way. The linear process really has us developing a series of scenarios. We can develop four scenarios upon which to base the R&D planning activity. From each of those scenarios or to each

of these scenarios, we are going to consider a set of 19 technology R&D areas.

And this is were I want to make an important caveat, Linda asked us specifically to focus on transmission technologies that would be appropriate for this element of the PIER Program as it develops. PIER already has more well developed programs in the area of demand response and in DER integration, in terms of the R&D planning side of those activities. So we have left some of those technologies off the list that we're going to be considering.

Although, honestly, to think about an electricity system in California in the future, you need to think about all of those together. But nevertheless, we are going to focus specifically on what we call the transmission related technologies for the purpose of our assessment.

So within each of those scenarios then, we are then going to assess what are the R&D needs of the scenarios? So we've come from a long list of technologies to a specific set of needs that are unique to each of the scenarios.

Then, we're going to go through a

process, in which we apply criteria and considerations that were developed by the PIER Staff, that are essentially the screen, the thresholds that must be met in order for R&D that might emerge from the scenarios to be considered appropriate for inclusion of a portfolio of PIER activities.

And the important part of that, really is an assessment of both the interest in and capabilities of market players and stakeholders for R&D to really address the question that I'll come to and speak to more directly when we get to the PIER criteria about what R&D would not adequately be pursued by the private sector independent of the PIER funding.

So, where is the PIER funding going to make a difference that is uniquely in the public interest consistent with the charter in which those PIER funds were created to support. And so out of that filtering process, that screening process, from this long list of transmission technologies, to the needs specific to the scenarios, to those subset of activities that might be appropriate for inclusion of PIER.

I will then identify a series of

priorities that emerge from our scenario planning analysis. There are a number of issues I would like you to keep in mind as we go through this process. I want to be very clear about what it is we are doing and what it is we are not doing.

I think it should be clear from the comments that have gone before, this is just one input to a large process that the CEC is managing. We are not representing this as a proposal for a transmission plan. This is an input based on a scenario analysis of the kinds of R&D that we think make sense under PIER, under different future states of the world, that might or might not take place.

Again, I've made this caveat, we've limited the list of technologies that we would consider to those that would be appropriate for consideration within the program Linda is managing. There are other activities at the Commission that are, of course, absolutely called for by many of the scenarios, but we're not going to really focus on. There's an R&D planning process that is already well underway in that regard.

And really, again, going back to this

notion of scenarios, and presented scenario analysis many, many times we're going to break after this one, so we can ask clarifying questions about the scenarios. But, a lot of the anxiety about scenarios is in confusing scenarios as a planning tool with scenarios as either a prediction or a preferred policy scenario.

This is not what we are doing. This is in no way to be confused with anybodies vision about how the California electricity system could or should evolve, or rather should evolve.

It is a focus on articulating, taking grains of what exists today and extrapolating them into the future, into a logically consistent view of how the future might evolve that may or may not occur.

And so I'm going to ask a series of questions at the end of this Workshop, at the end of my presentation, excuse me, that ask you to come back to us and sharpening the strap for publication. Do these scenarios make sense? Do they hand together? Do they provide an adequate basis for the type of planning that the CEC would like to see take place?

Not, is this what we want to have happen

in California. What are the policies to get us to this or that state. That is not the goal of this activity. I want you to really keep that in mind. I'll say this more than once, because I think it's very easy to slip into, well I don't like this part of this scenario.

Well, it's not a question of like or dislike, it's a question of could it happen and could it happen in this way? Is it a logically, is it not only logically possible, but is it logically coherent that it could happen this way? Are the antecedence there that make this something that is a realistic basis for conducting a planning exercise?

Finally, again, the criteria that I want to apply the considerations articulated by PIER Staff. And so those are the, again, the screen that I want to use. It's not sort of, Joe Eto's idea of what he things public interest R&D should be, this is really the PIER Programs. And I've attempted to implement them in this analysis.

So let me start by reviewing the transmission technologies considered. In the Draft Report, we have a long appendix detailing, in a sense, capsule summaries of 19 district

transmission technologies that might be considered in this type of an R&D planning exercise.

I won't claim it to be a perfect list. I won't claim it to be an exhaustive list. I think it's a good starting point. For the purposes of the discussions that we have today and for the purposes of the report, I've attempted to group them, to categorize them into larger buckets, because it's easier for me to refer to them, rather than try to talk on 19 technologies about each scenario.

And so I grouped them into real-time grid/asset monitoring and analysis tools. And you can see listed the kinds of tools, their monitoring, their sensing, their communication, their analysis tools to help operate the grid more effectively with essentially better information and better communication on that information.

The next category are power-flow control tools, and I include energy storage, very short-term energy storage, not pumped hydro in that area. These are where the fax devices, the power-flow controllers are being considered.

I have another category, which is a broader category, it may not be thought of

traditionally as R&D, but which I believe is absolutely an appropriate focus for Public Interest R&D potentially, which is market design,monitoring and analysis tools. Similarly, on more the analytical side, we have a category of transmission expansion planning tools and approaches.

And then finally, we have a number of, you know, really bedrock public interest kinds of issues with regard to public health, safety and environmental issues.

Some of the things that may be more conventionally thought of as transmission R&D we've grouped in three categories. One is this issue of transmission hardware, upgrading the transmission lines, the towers, the conductors, the transformers, the equipment side of the transmission business.

Now I want to make a step-aside here. This afternoon you're going to hear a presentation from Navigant, where they have also divided the transmission R&D world. They've done it in a slightly different way. So I want you to go past the label, transmission hardware or transmission component research and really focus on the

technologies and what is being said.

Because I think Navigant is using a slightly different, there's an overlap, but there is also some differences. And I want you to be clear that these were not coordinated. So we're using actually different terminology. So be aware of that when you come to that discussion later.

Then I have advanced transmission technologies, really things that are much further out there, polyphase transmission, high temperature super-conducting technologies, both for conductors and for transformers.

And then finally, advanced real-time control approaches. And I'll refer to these seven categories of R&D as I go through the analysis. These will be the labels that I'll be using for classes of technologies.

Now, this is really quite important here, these are the criteria that PIER is using in considering the types of R&D activity that are appropriate for support through the PIER Program. And some of them make, they're to improve the quality of life for California citizens, approve the efficiency and reliability of electricity transmission systems in California and to advance

science and technology.

And I want to highlight one that I'm going to speak a little bit more about, which is unlikely to be adequately pursued or provided by the competitive or regulated research sectors. And this is really of fundamental importance. If PIER is to make a difference, it has to be focused on things that don't duplicate what already going on out there. That add to, what is already out that in ways that are consistent with these important public interest goals.

And so a lot of my assessment that I'm going to be conducting, speaks to the question of whether or not the private sector acting on it's own, will pursue these activities. And specifically, there are these clarifying considerations for why the private sector may or may not be willing to pursue these things on their own.

Among them are many of the traditional arguments for public interest R&D. You know, the development risk is very high, and/or the development time horizon is much too long for the private sector.

Yet, not pursuing the research would

forego the kinds of benefits that I've identified on the previous page in terms of improving the quality of life for California citizens, improving the efficiency of the transmission system and advancing science and technology objectives.

Development costs are too high. But California -- benefits -- might be substantial. If this is a foregone opportunity here, that cannot be accessed without PIER playing a strategic and enabling role.

And finally, you know, looking more at the institutional side, that the market and regulatory regs again are a reflection of the state that we find ourselves in in California. That the business case can't be made by these private companies to make these types of investments. Yet, again, absent the type of enable support PIER can provide, these activities and these benefits would not be enjoyed by California's ratepayers.

So the translation of these considerations for the assessment that I report in the paper, is really to do an analysis within each of the scenarios for the stakeholders, for the potential R&D providers to assess the kinds of

interest they're going to have in undertaking this research. As a way of determining what research might not be addressed adequately by the private sector, and therefore becomes appropriate, given these larger public benefits for support under the PIER Program.

So now I am turning to the scenarios. I'm going to present each of the scenarios, the bare outlines of the scenarios and then we're going to take a little break for clarifying questions.

So, just let me tell you, we postulated four, mutually exclusive to some extent, although to some extent overlapping, independent scenarios that might represent where California might be over the next five years.

The first one is something that I hope that we are all too painfully familiar with, which is a continuation of existing trends. And I call that, and thanks to one of my reviewers, muddling through. Just getting along with what we have here.

Then, I postulate three distinct take-offs from where we are today. Each of them distinct in very important ways. One I'm going to

call State Mandated Solutions, which reflects a much more aggressive and proactive role by the State and not just the Commission, all of the State Agencies from the Governor's office on down towards setting the agenda for California's energy future.

I'm going to them postulate another takeoff from the muddling through to greater regional coordination, greater involvement of the entire west in addressing issues that are here in California.

And then finally, I'm going to go the other way. And you can see these are referred to different levels of organization and coherence in terms of decision making about energy solutions for the State.

And them I'm going the other direction and looking at a scenario called Local Solutions Emerge. Where you have much smaller entities in size and geographic scope in making decisions about energy futures for the populations that they report to.

And again, period of analysis, just five years. So we're not talking about ten years or twenty years out. I think we should be thinking

about those kinds of things, but that's really beyond the scope of where Linda's asked us to focus for helping her shape the PRND Portfolio.

And again, in presenting these, I want to focus on the extent to which they are logically possible, that they are logically coherent. And, you know, as a result of having started this process, just, what, five-months ago Linda?

MS. KELLY: Uh huh.

MR. ETO: You'll see, some things are probably already out of date. And that's the nature of the kind of playing that we have to engage in in today's environment.

And let me make one more final caveat. Again, not predictions. And so none of these are going to be perfect. In fact, I think none of them are -- all of them have lots of questions that are going to be unanswered about them. And so I want to again, reenforce that, that I'm not trying to argue for one over the other as being preferable.

Although, I would submit that muddling through is probably not what we want to continue to do. So here is this Continuation of Current Trends. And this refers to an extended period of

financial distress, institutional conflict and lack of resolution as a result of the electricity crisis. This is a very familiar story, bankruptcy proceedings are protracted in terms of who has jurisdiction, how will settlements be made. The refunds get drawn out, orders are issued, they are contested, basically not a resolution of many of these fundamental issues that we're trying to grapple with here in California.

Strife between FERC and the State. You know, continued grandstanding about where SMD is going to be, you know, the law of the land or what does that actually mean if it becomes the law of the land?

More importantly for the kinds of transmission that we're going to need in this State, that the financial distress of the merchant generation sector continues leading to no construction. You know, that we soon run into shortfalls again in the west. And I don't see good ways out of that.

There is some, I don't want to call it relief, but there is some mitigation in the form of lower demand growth resulting from both economic woes at the State budget level, as well

as, you know concerns about the health of the power sector and concerns about the vitality of California's electricity system.

A specific instance that we postulate here is the upgrades of Path-15 are delayed. We again as a result of these supply shortfalls enter periods of rolling blackouts.

Turning now to the institutional side of this. And this is a pattern that I'll repeat for all the scenarios, kind of some, an overlay and then a specific institutional assessment. And postulate that the transmission assets will continue to be owned by the IOUs.

They will still be financially challenged. Operation of the assets will continue by the ISO. The mission will remain the notion of keeping the lights on at any cost, and sometimes a very high cost. With very poor investments for transmission. Just as you very little generation coming in, you have no knew transmission coming in.

The kinds of transmission planning that's going on in the State is basically for this long cue of generation interconnection requests. The problem being both the cuing issues itself, as

well as the fact that many of them actually don't materialize because of the financial distress leading to cancellation of many of these plans.

An important point about this transmission planning question is that there really isn't a policy consensus about the role of transmission in enabling economic trade and in the role and reliability in this State, and that is fundamental to holding up, sort of moving forward with the kinds of investments that might be considered.

The MDo2 is not yet in place. There are not systemic fixes being made, necessary to the market. And again, we have to rely on price caps, really as a circuit breaker to markets that are still not fully under control.

From a reliability and management standpoint, we do not have meaningful penalties for failing to comply with reliability rules. We still have essentially, a gentleman's agreement among transmission owners and operators about how the system is managed.

I know that's changed somewhat in the west, we're moving toward that kind of, in fact we have that kind of a structure in place, but the

kinds of penalties that might be considered under a stronger form of that are not yet in place.

Let me turn now to the second scenario, State Mandated Solutions. Here what I postulated is a very strong State lead initiative, a coordinated set of activities by multiple State Agencies to get California back on track with regard to its electricity supply and demand picture. That's facilitate by great deference by the FERC to these State lead initiatives. You know, -- backs off on SMD, or doesn't call it SMD anymore.

We have a reinvigorated and a very aggressive State lead planning activity for new generation, renewables, transmission and demand side resources. We re-institute the buying of processing, some of this is actually starting to take place already.

Much more streamlined and tightly quartered siting and planning processes, and State backing and leadership and directing investment, directing IOUs to sign long-term contracts to enable merchant generation to come back into the State.

The in State supply/demand imbalance is

reduced as a result of these activities. But California is still dependent upon the rest of the west for imports to meet loads. And so one of the challenges in this scenario is the coordination that needs to take place and the uncertain mechanism by which it will take place with the rest of the west.

We may be able to take markets in California, but it's not clear how the seams issues essentially get worked out with the rest of our Western States, upon who which we depend for imports. And I postulate modest demand growth here as well.

Looking at institutionally here, we postulate again, continued ownership of the assets, transmission assets by the now financially healthy IOUs. We're back on the path to financial recovery. The bankruptcy issues, or the path out is resolved. The refunds are favorable and we are moving forward in sort of, bringing the IOUs back into financial health. Continued operation of the transmission assets by the ISO. Continued mandate to keep the lights on at any cost.

Much better regulatory incentives for transmission investment. This is a scenario in

which transmission investment is possible once again because the certainty is increased that the investments will get the return that they require for putting up the types of capital that's required. There is a coordinated siting and planning process that facilitates actually building transmission lines in California once again.

The State is back, and that in a sense through the policy side, the body is much more aggressive, and I hate to use that term, but I think it is appropriate integrated or coordinated resource planning process, in which it is focusing on reliability. And the importance of reliability for California as a backbone of the economy that the electricity system provides.

And we move to a state in which MDo2 is in place. But again, there are seams issues. What works in California, how it coordinates with the rest of the west. Some of these are issues still to be resolved.

Still an absence of penalties for responsibility and reliability rules of road in this scenario.

Let's turn now to the third scenario.

This is the Greater Regional Coordination Scenario. And this is the scenario that leads to a much more unified, I'm not saying standard, unified market design for the west.

It's implemented through the creation of three large regional transmission providers. So this has a lot of SMD overtones, but I don't want it to be read as this is SMD. I think SMD allows for a lot of variation and those are things that need to still be explored.

Regional Resource Planning is initiated leading to issues that begin to address these multi-jurisdictional issues that transmission planning is really struggling with at this time. Yes, these institutions are not fully mature. You know, it's going to take time to develop these things and so there are false starts. There is room for improvement. So I wouldn't say it's perfect, but I think we have some placeholders in place.

We have a much more stable market across the west, leading to much healthier climate for private investment and generation. Again, much more healthy IOUs is part of the scenario as well.

There is an adoption of the LMPs. We

have a much better market signal send to generation to locate work and help the transmission system rather than where it seems to be convenient to get access to natural gas.

We have much more stable opportunities for demand side participation in the markets in this scenario.

Turning now to the institutional underpinnings of this scenario. Again, similar to the prior scenarios, ownership of assets by the IOUs. Operation by the ISO. Siting and permitting coordinated again by these regional bodies to begin addressing these cross-jurisdictional issues. Again, issues of false starts, not perfect, but mechanisms are in place.

Much better venues, or forums for trying to address what I believe is the thorniest issue of transmission investment these days, is fairly aligning the cost and benefits of transmission. Who has to pay for these things, versus who is receiving the benefit of the transmission investment. Lots of issues to be worked out here. Yet, there are venues and forums for this to happen on a regional basis.

Again, improved returns and increased

regulatory guarantees for transmission system investment. This speaks principally to the IOUs. And what we postulated specifically was the adoption of performance based rate making mechanisms, which will allow utilities to benefit through transmission investments that would improve the operability of the transmission system. And this is really a fundamental disconnect that we're struggling with right now, here in California.

Here we postulate essentially the transformation into NAERO with delegated authority, essentially to the Western RTOs to be the primary managers of reliability within those regions.

Let's turn now to the fourth scenario. So prior two scenarios involved decision making and leadership at higher levels of aggregation, both at the State in scenario 2 and at the Region in Scenario 3.

Scenario 4 postulates a very different kind of world in which local solutions emerge. Essentially local governments, local organizations assume a much greater role in energy planning for much smaller jurisdictions or aggregations of

customers.

We see limited municipalizations taking place within certain urban and rural areas within the State responding to those local pressures for greater self-determination at the local level.

As a result, increased reliance on smaller scale distributed generation renewables, energy efficiency. Critical enabling assumption is that the regulatory, in particular utility -- to distribute generation have successfully lowered.

Another critical assumption of this scenario, is that there are important cost breaks with this on the capital costs of the interconnection and -- technologies for distributed generation. You're not going to see this flowering of DG just because you think it's a good idea, but if it's going to make economic sense in the business cases can be made at the local level for those types of investments.

One of the implications of this scenario is that demand growth, at least as seen from the bulk transmission perspective is in some sense lower, because much more of the demand is being supplied by local sources of generation or demand

for that matter.

And then finally, a contributing factor to this, again, is public opposition to the large scale centralized generation facilities or the highly visible transmission facilities required to bring that power to loads. Again, that supports the notion to have much greater local self-determination on these energy planning issues.

This scenario is an interesting scenario for us to work with, because in fact, it might be consistent with any one of the three scenarios that I've already articulated, in terms of the other scenarios really focus on a vision for how the transmission system is operated, and this scenario really focuses on how changes might take place at the distribution level.

And so the principal effect that I'm going to be examining from a transmission R&D Portfolio standpoint, is the effect that these demand reductions, or the fact that there is a lot more active sources on the distribution system I have, has on the operation of the transmission system itself.

With this, I think I'm going to take a break. Ask Linda to come up here, and ask if

there are clarifying questions about the scenarios themselves. And I'll use that as an opportunity to them segue into the R&D Assessment and the R&D Priorities. So, Linda?

MS. KELLY: Okay, this is the break that I talked about. And we're looking for clarifying questions, not questions about the results yet. And I'd like to open the questions first to Commission Rosenfeld and Geesman, do you have any clarifying questions you'd like to ask Joe? Okay, anybody from the public? Are there clarifying questions with regard to the scenario analysis? Will you please just come up to the microphone.

MR. MOLLURE: What does MDo2 mean? I'm not familiar with that term.

MS. KELLY: What he asked was --

ASSOCIATE COMMITTEE MEMBER GEESMAN: You need to get that on the microphone.

MR. MOLLURE: Why don't I just repeat the question?

MS. KELLY: Yes.

ASSOCIATE COMMITTEE MEMBER GEESMAN: Doesn't he need to identify himself.

MS. KELLY: Yes. Could you just come up? It just would be easier. Sorry.

MR. ETO: It's a simple answer too, but I know they have a process they want to use here.

MR. MOLLURE: Right here?

MS. KELLY: Yes.

MR. MOLLURE: My name is Joe Mollure. I'm not familiar with MDo2, could you explain that?

MR. ETO: MDo2 is the shorthand for market design 2002, which is a comprehensive market redesign that the California ISO has -- is in the process of implementing to modify assets of many of the markets that they currently operate in and begin to operate new ones if they haven't in the past.

MR. HAWKINS: Dave Hawkins, California ISO. Just a clarifying question. It's sort of underlying the -- to go back to the beginning, the purpose of transmission of course, is to connect resources to loads and to be able to move those. So where ever the resources are located -- I think it would help a little bit if we went back and laid that out as the very beginning as a, here's what transmission -- the purpose of building transmission in the first place.

Second, then, underlying each of your

scenarios are some basic assumptions about where generation is going to be built. And it comes out in the fourth scenario, fairly clearly, but the, I guess one of the big issues facing us is, how much generation is being built, either outside the State, in Arizona, Mexico, other places and the issue then is, how to fold in those locational issues of generation and the corresponding impact back on transmission.

MR. ETO: That is a -- I'm going to speak mostly to you in the second comment. And it is a very appropriate observation. And let me try to spin back to the scenarios themselves. Under the Continuation of Current Trends, very limited explicit, what I would call planning is being exerted with regard to where generation is being located with respect to the consideration of transmission issues.

Under the State Lead Solutions, the 2nd Scenario, there is a much tighter coordination between in-State generation, renewables for example, and transmission planning, which is an important part of seeing a more coherent energy picture emerge within the State.

That said, outside the State is not

really being addressed. And so to the extent that California is dependent upon out-of-State imports and to the extent that the location of that generation is not within the scope of something that the State is helping to integrate into this portfolio, that remains kind of wild card and a challenge for transmission planning, in particular.

And it's one of the reasons we postulated the third scenario, where you had this greater regional coordination, where you had this opportunity to have forums and venues where these trade-offs between out-of-State generation, more local generation, the transmission infrastructure necessary to enable or to direct, so to speak, if you want to think of it more aggressively, where that generation is located has an opportunity to take place.

And again, final scenario because you can plan it correctly, the location is very much more local. But that said, in the next five years, you know, the amount that you can take off the bulk system and put down locally is limited. Thank you.

MR. ALVAREZ: Manual Alvarez, Southern

California Edison. I have a question, I guess on the greater regional coordination and then the local solution. I'm and not clear how the State/Federal issues are resolved there, or addressed. I see how they're addressed on the first two scenarios, but I'm not clear how they are handled on the next two.

MR. ETO: Clearly the greater regional coordination scenario envisions multi-State entities acting in a more coordinated fashion. And the presumption I guess would be that it would be with the blessing, of, say FERC, with probably tremendous deference to those entities to do that determination on a regional basis.

In the 4th Scenario, I don't see -- we don't focus on that because in some sense, it's external to the way that scenario was formulated, in that mostly what we're talking about is a scenario which has a lot more generation taking place at the distribution level, in which, I think the Federal/State issues are in some sense, ancillary too.

Although, what we did suggest is that in the 4th Scenario, you could envision it as potentially sitting along side any of the other

three scenarios. So to the extent there was a Federal/State interaction presumed in the first three scenarios, it can be presumed in this 4th scenario as well.

But, there is no unique one that we think is dictated by what is required for this scenario to take place.

MS. KELLY: When you have a question, you can just forward.

MR. ETO: In fact, if you just want to make a line. Bring them on.

MR. ZAININGER: Hank Zaininger, Zaininger Engineering Company. And my question is, is I'd like to see some clarification on the time frame. You have a five-year time frame for R&D to actually implement transmission projects, it might be optimistic to get some transmission projects implemented within five years.

So I guess my question is, are you talking about R&D for time periods going past the five-year time frame, or are you talking about having transmission things completed within the next five years?

MR. ETO: I'm going to start an answer to that question and then I'm going to ask Linda

to tell me where I missed it. But my understanding of my charge was to provide input to the CEC that would help them prioritize R&D that they need to start in the next five years. There is obviously a life cycle for that R&D moving toward, you know commercialization effectively, that may well exceed and often does exceed five years.

But the idea was, they need to make some decisions in the next year about where they are going to make these PIER investments. And we didn't think, or we agreed that I would consider these scenarios as being operative for about five years. What happens beyond that, we can certainly talk about, but that really wasn't intended to be the focus.

Again I think a rationale for that was, since these scenarios are extrapolations of threads of current trends, it's even harder the further out that you go.

MS. SHARPLESS: Jan Sharpless. I wanted to ask to what extent do you consider the changes in reliability standards impacting on your scenarios. Since there is currently a review underway for changing reliability standards?

MR. ETO: We consider changes in Reliability Standards principally from the standpoint of the oversight and essentially authority that reliability management takes on under the different scenarios. And I'm not focused, particularly at this point on the exact rules themselves and how they might in fact evolve.

So the principle distinction for us is moving from some of the systems that we have now in which the west is actually quite far advanced, in terms of having essentially, reliability rules of the road that people have agreed to and they're being sanctioned associated with that.

To bumping that up to where there are significant financial implications from non-compliance. And there is in fact a formal recognition. And this would have to take place through national legislation of a role, for something like a NAERO to be delegated that authority by FERC in a more formal manner.

MR. AHMED: Syed Ahmed from Southern California Edison, Company. I am a research engineer. Mr. Eto, what I wanted to know is the thought process regarding the priorities on

transmission technologies? Is the priority real-time, great asset monitoring and analysis tools? This is prioritized or it's a preference?

MR. ETO: I'm going to speak about the priorities in the next section of the talk. I'll try to address that as part of my comments about that. But I guess I'd ask that you ask that question again if it is not adequately addressed in the discussion.

It sounds like that was the segue to start talking more about what I actually -- could you get me a little more water? Thank you.

Okay, so the process from here out, is I'm going to go through each scenario again, give you a capsule summary of the R&D Assessment and then describe the priorities. And I hope some of that will address the rationales for those priorities that we developed of respecting the PIER criteria considerations that we were given to work with.

The assessment that takes place under Scenario 1 is that the supply/demand imbalance greatly increases the risks of blackouts. That the markets themselves are dysfunctional. There are continuing price fights and the need for

circuit breakers to mitigate them. And that real-time grid reliability management is a significant ongoing challenge for the grid operator that's exacerbated again, by the supply/demand imbalance. And by the fact that there has been no new significant intra or inter-regional transmission line construction.

The IOUs themselves continue to be under a lot of financial pressure in this scenario. There are no funds essentially available for any internally supported R&D. The CA ISO remains an operation entity, which essentially has no mandate for R&D. That is the precursor to the priorities that I'm going to articulate for this scenario.

So what we did, is we took those seven categories of priorities and attempted to group them principally into higher or lower priorities. And then in some cases, non-priorities. And this is a scenario that I think by applying the criteria of the PIER Program, most, if not all R&D that is in the public interest could be justified. Because there is basically very little investment taking place. And a great need for the types of support that PIER is able to provide that would otherwise not be provided.

So again, the exercise became much more one of prioritization with respect to the highest needs. And these reflect our opinion and based on the criteria and assessments that we have undertaken.

So under the highest priorities we identified real-time grid asset monitoring analysis tools. Our rationale here, was that these are probably the most cost effective, short-run ways to increase transmission capacity in the State and they are not being undertaken right now.

We think that it is appropriate to look at the relationship between those in advance real-time control approaches. And a critical need in this time, in this scenario is the notion of R&D to improve the design of the markets, the monitoring and analysis tools that are required to get us on the path towards having stable markets for electricity in the State.

Lower priorities reflect the fact that there is very little, if any significant transmission investment going on at all. And so the transmission hardware and power-flow control devices, those are all lower priority because they are the next most costly option in terms of

improving flow on the transmission system, yet there is no business case that can be made for making those investments at this time.

Similarly, I think transmission planning is absolutely important as an objective, but without a clear case for how that investment is going to take place, I think your putting the cart before the horse in terms of focusing on those activities.

Our assessment of the Public Health and Safety and Environmental issues, which will be cross-cutting, which is that it is an important public interest R&D priority, are both the observation that it is being addressed, in fact, in many ways by other parts of PIER and other parts of the State R&D activities, but it remains a priority on the issues that are unique to transmission.

Under the State Mandated Solutions, our assessment was that the supply/demand imbalances were less severe. But, California would still be very dependent upon imports. In-State supply/demand imbalances were less severe. Again, we have this issue of seams and market coordination between California and the rest of

the west.

We continue to have these issues, again exacerbated by seems and by supply/demand imbalances. For real-time grid reliability management. We have limited in-State construction of transmission lines. But again, lack of resolution of how you do that on a multi-jurisdictional basis.

The IOU's becoming financially healthy are once again able to support internally funded R&D. They are limited to topics that are within the scope of the way in which the control of ISO assets is defined. So it's going to be incremental, related to incremental new construction. Not necessarily related to regional coordination. Not necessary related to the issues of how you operate the assets.

California ISO remains as operational entity. Again, limited mandate for transmission R&D.

On this scenario, we see many of the same high priorities. Again, reflecting the need and the value of the real-time grid monitoring and analysis tools, advanced real-time control approaches. Again, market design, markets are

still evolving. There will be seams issues.

Market monitoring in particular is a very important focus for the kinds of things that are needed. But now, a return to transition planning. A need for methods and techniques to begin considering the multiple attributes of transmission and what it brings into a resource portfolio mixture. And how can you trade off with some of the other options addressing those same issues.

Within the lower priorities, we have the same types of technologies, again, focus on the hardware technologies, the power-flow control technologies, including energy storage, advanced transmission hardware technologies, public health and safety. But here, we indicate an appropriate role as to try to leverage.

Now that the utilities are financially healthy, able to support this internal R&D, the goal of the public interest research, ought to be to sort of leverage and help accelerate some of those activities. But those needs ought to be identified, principally by the controllers of those assets, namely the IOUs themselves.

In the Scenario of Greater Regional

Coordination, much better supply -- postulating that there is improved coordination between and within the region. Much more stable financial investment and climate. Markets better integrated. Seams issues become less of a concern.

The issue of region wide real-time reliability management is technically challenging, but forms an institutions for data sharing and coordination are emerging. There is a much more coordinated regional transmission plan process. It's integrated with both supply, demand and transmission projects.

And again, IOUs again are postulated to be more financially stable in this environment and able once again to support internally funded R&D.

Here the priorities remain essentially the same as those in the prior scenario, but again, as the entities themselves that have principle responsibility for managing or operating these assets become better able financially to support R&D.

The PIER or public interest role is one of supporting and of enabling these activities, which are essentially being more directed by the

entities themselves at this point.

So very similar list of priorities, but slightly different shift in the role that the public interest funding support plays in each of those scenarios.

In the 4th Scenario, again is postulated, that might be consistent at the transmission level with any one of the three scenarios that we've already articulated. And again, the net effect on the transmission system is reduced reliance overall, but still, you know a significant reliance on bulk transmission for supplying the majority of the electricity needs of California.

But the focus on having much more active, a greater number of active sources on the distribution system, is, these questions that arise from essentially having two-way power flow, or the potential for two-way power flow on systems that were designed essentially for a top down flow from substations to customers.

So the priorities again, similar to some of the earlier scenarios, with an increased focus on those unique issues that result from trying to integrate and coordinate the operation of many

more distributed sources on the distribution system. So here, real-time monitoring and tools would be extended to include things, like operating and coordination with much more distributed generation.

The notion of transmission planning itself needs to expand to include distribution planning to some extent. There is a -- because it's certainly another option that needs to be considered.

Lower priorities again similar. The change, so there are changes in the sort of emphasis within each of the activity areas. There is a greater focus on local public health and safety and environmental issues. Because again, the presumption here is, even though these local entities have greater self-determination, they themselves are not constituted as R&D entities, or ones that are going to pursue public interest in R&D that might have wider spread benefits.

So this concludes the formal remarks that I've prepared, summarizing the results on the paper in which we are inviting you to comment today, both verbally and in written form, I guess prior to the 19th?

MS. KELLY: Yes.

MR. ETO: Let me close with the kinds of questions that we discussed internally, as ones that might be appropriate to discuss in this Workshop. The first one is whether the scenarios themselves provide an adequate basis upon which to assess future transmission scenarios? Are they broad enough? Should there be more or less, should they be different scenarios than the ones we've thought about that enable or underlie this type of an activity?

The second was, is the assessment of the R&D needs of each scenario complete? Does it really capture the kinds of R&D that is appropriate for transmission as it might be envisioned in each of these scenarios?

Third, to assess what might be appropriate for a public interest program, is the assessment that we've conducted interested in the capabilities of the various market participants, who might otherwise pursue this R&D consistent with the scenario descriptions themselves? Do they hold water in terms of what entities will or will not do under one or more of these scenarios.

And then finally, not finally -- are the

priorities that we've identified for the ESI Program consistent with those criteria? Have we actually applied our methods in considerations appropriately to derive from this list, things that might be priorities for the PIER Program?

And then finally, more of an open ended question. And I think this probably will go throughout the day, about the other factors that the Commission should be considering in developing an appropriate portfolio of R&D in this area?

So that will conclude my formal remarks and I guess we'll move to questions again.

MS. KELLY: Could I remind everybody as we go forward with questions to give your card to the Workshop recorder. He is really diligent about going and getting it from you, but it would really help if you would just bring it up with you and hand it to him. Commission Geesman and Commission Rosenfeld, do you have any questions at this point?

COMMISSION ROSENFELD: Not yet.

MS. KELLY: Okay, I'd like to open the questions to the audience. And if you could just come forward one at a time. I think that would work the best.

MR. O'CONNOR: Good morning Commissioners, good morning Staff. My name is Tom O'Connor. I'm familiar with Joe's work and I'm very impressed with it. My question has to do with how you determine priorities under your third and fourth scenarios? And how do you make the determination, what's the highest priority and what's the lower priority?

And my question is, is that tied into some of the regulatory activity that are going on in terms of implementing renewable portfolio standard. There is some very broad policy implementation going on right now in terms of bringing renewable power into the grid by 2017, and my question is, is this tied into that kind of thought process? And if it isn't -- I saw some reference earlier, but not under Scenario 3 and Scenario 4.

And under the RPS in SB 1078, the PUC is engaged in activities to see whether out-of-State generators will be able to provide power to the grid. And my thought is, this is the kind of research you need to try and determine how to make sure that they are able to do that. So I'll open that up for discussion.

MR. ETO: I think the notion of development of the renewable resources in some ways in another way to think about some of the questions that Dave Hawkins had asked a little bit earlier about what generation, where located and what the implications for interconnection might be?

And so, I would offer essentially the same types of comments. You have venues in Scenario 3, by which you might have greater coordination between the transmission planning needed to support renewable developments that might be more remotely located than you do in the other scenarios, particularly if they're out-of-State.

Certainly in Scenario 2, you know, there is an absolute assumption that renewables are an important part of the mix of the State. And that the integrated process for planning with the State leads considers that as part of an input to the transmission planning process.

Scenario 4, really only thinks about renewables in the context of more locally that might emerge as a result of local energy planning by smaller jurisdictional entities, so to speak.

And so, again, interconnection issues there, really are similar to the ones that might be faced by all distributed energy resources operating essentially at the distribution voltage levels.

MR. O'CONNOR: I guess my comment is, how is it possible then, to take a look at what's being developed on a program level as a criteria to determine what is the high priority and what is not a high priority? I mean I'm just trying to understand the criteria you used for distinguishing those items that fall into the highest priorities as opposed to those items that are under the lower priorities.

MR. ETO: Is it a question about the classes of technologies that might be considered and that they're, I mean -- have an interest in connection technologies?

MR O'CONNOR: No, actually, my question is a little broader than that. Did you give any consideration to the rule making going on in the public -- under the PUC in getting renewables into the grid in determining what your priorities are?

MR. ETO: In the general sense in which renewables play a greater role in California's energy future, there is an assumption about

renewables. To my mind, the types of transmission technologies R&D activities that will be appropriate, you know, for those kinds of questions are subsumed or included in the list of technologies that we did consider.

MR. O'CONNOR: I guess my thought is to make is a little more explicit in determining between high, the highest and lower priorities to it's easier to understand for stakeholders as to the thought process that was used.

MR. ETO: So your questions is really what is the difference between higher and lower priorities.

MR. O'CONNOR: And what if, any State Energy Requirements, Purchase Requirements played a role in that determination.

MR. ETO: So then let me answer very clearly, did not play an explicit role, other than the role in which renewables play in any of the scenarios. And that the assessment really spoke to public interest R&D needs that would be, in some sense most unmet in the absence of the kinds of support that PIER provides for the kinds of activities that we judged to be appropriate.

MR. O'CONNOR: I agree with that thought

process and I'm just suggesting that because IOUs now are under an obligation to increase their renewable power procurement obligations up to 20 percent by the year 2017, that the transmission planning for that obligation is not adequately provided by the regulated or competitive markets.

MR. ETO: Well, certainly in Scenarios 3 and 2 we were very explicit about the need for R&D to support improved transmission expansion planning techniques and approaches. And maybe the word transmission planning is the wrong word, I view this as resource planning approaches in which transmission, generation, either remotely located or locally located can be assessed in a consistent fashion. And the values that each of them bring to the energy system can be assessed.

And so, you know, it's not specific to renewables, but it certainly can't accommodate the role that renewables might play, either remotely or locally sited, then I would say it's not a very good planning approach.

MR. O'CONNOR: I appreciate your answer. I have one more question and then I'll close with respect to your local scenarios. There is part of the RPS after June, and the CEC is playing a role

in this part, is to identify renewable distributed energy resources that could be used to meet the overall goals of the RPS Standards. I would suggest that there should be some overlay in interaction between this activity and that activity, thank you.

MS. KELLY: Can I get a show of hands about how many people would like to ask a question? So if you could try to keep your questions as concise as possible. Joe, and you know, if there is additional information in the afternoon that we can provide to you, we'll just keep this moving along, okay. All right, next question.

MR. HAWKINS: Dave Hawkins, California ISO. First of all, let me congratulate you on a very readable document and well organized. I enjoyed reading it and enjoyed going through your scenarios.

The future will always be some blending of these scenarios. It will never turn out as pure as you've put it on paper. So, with that, let me also comment, the last questions, in terms of renewable resources, I think one of the interesting drivers is the fact that we can put up

wind generation resources now in six months or less and put up substantial megawatts.

So one of the challenges to transmission planners is how to have tools to assess the probability these things are going in and make sure that we do not have stranded megawatt resources. And so that's going to become an increasingly important issue of making sure megawatts are not stranded and we can get them to the loads.

Going back to your Scenario 1, which is Continuation of Current Trends, I think you underplay a little bit the regional planning that we currently do, because California does not exist in isolation, it really is interconnected throughout the whole Western States and so the transmission planning has to have a regional flavor, even under the current trends.

And the other important issue, which is implied, but probably not as clear to everybody as it might be to me and to you, is that the 500-kV transmission grid is essentially stability limited.

That's why we put a lot of emphasis on these real-time tools to say how close are we to

the stability limits? How much more can we get down?

If we had better monitoring, better R&D products, could we push that transmission system beyond what we do in off-line type studies. And perhaps we can provide a little addendum write-up or something that would help people understand why those particular parts of the R&D are so important for the future.

The other last comment I'd like to make is that although you have put, I think storage technologies as a lower priority, to me it seems that the fact that these R&D Programs, also then address longer-term issues.

We are hoping that storage technologies will play a major role in relieving transmission congestion. So as we get 20 megawatt to 100 megawatt type units that can be locationally placed to relieve transmission congestion and squirt energy in at peak periods of time to relieve congestion, I still think that it is a very important effort area. And even though it is longer term, I still would like to make sure that that stays a fairly, at least a medium level priority for the future. Thank you.

MR. ETO: Could you stay Dave, because I'm going to ask you a question, just to return the favor?

MR. HAWKINS: I thought this was too easy.

MR. ETO: Well, because what I'd like to do is clarify some of your comments from the standpoint of the things that maybe would be important for the Commission to think about. Your comment about wind is very well taken. And I think it speaks both to an institutional question about planning for new wind generation, as well as an infrastructure planning question about how you actually do the interconnection studies. And so I want to make sure that we capture both of those, if that's correct?

MR. O'CONNOR: Yes.

MR. ETO: In Scenario 1, I think the point that there is regional planning taking place is well taken. I chose not to highlight that. I chose to focus instead on the fact that, there is, in fact no investment in transmission taking place. So, yes we hope to get there. And again that's an extrapolation of some things.

I suspect the Commission would be quite

interested in any additional material you would like to provide for them to consider. Maybe Linda can speak to that. I don't -- there is probably a larger process that I'm not involved in that speaks to they might want to receive input on additional transmission technologies.

And then finally, this issue about storage. I think maybe where you could help the Commission with this is, is the need for R&D on the storage technologies themselves, and would that be appropriate for a transmission program. And/or, is the need for, perhaps system integration and operational tools that allow you to use them more effectively once the "technology" itself is in place.

MR. HAWKINS: Because I think we really need both. We're particularly interested in the second piece, which is, what is the impact on the transmission system itself? If I could do some of these injections from a storage technologies, how would I locate it? How would I dispatch it? The kinds of things that I could do to make optimum use of it.

I'm hopeful that the RFP that is being put together now by the CEC for demonstration in

new storage technologies will reveal some of the new techniques and electrolytic batteries and all the various types of technologies that hopefully we're going to see commercially available in the future.

MR. LORDAN: Good morning Joe, Rich Lordan, EPRI. Nice paper, really, very readable and I appreciate it. I think that using the four scenarios you captured the highest probability outcomes, not necessarily mutually exclusive, but highest probability outcomes. Did you ever do any consideration of low probability high impact scenarios, such as terrorism, given the situation of the world. Perhaps that a remove possibility, but a high impact scenario?

MR. ETO: We actually did. In fact, in some of the earlier versions of the scenarios, we thought about, you know, some really catastrophic kinds of events. And ultimately, we went through a process where we looked at what might be the implication for transmission R&D Program under PIER and found that some of the same kinds of results were emerging.

The types of "R&D" in the public interest that might be appropriate, in many cases

were much larger in scope and in, so to speak, jurisdiction in transmission. I mean they spoke to things like emergency preparedness in terms of infrastructure and site security kinds of precautions. Things that are really quite outside the scope of the transmission element of the PIER Program as well were being directed to try and focus on.

And so, we ultimately decided that thinking about those types of events in the earlier versions probably as like a wild card events. That they really did not have a material effect on the kinds of R&D priorities that we were identifying with more or less conventional transmission kinds of technologies that were going to be within the purview of the things that Linda will be looking at.

But, I want to make it really clear. I think that R&D is beginning to address those kinds of functions, absolutely in the public interest. And there are important questions about how you conduct that R&D and how the State is involved in that process.

I know there is a new department of Homeland Security that's going to be doing a lot

of these types of things as well.

MR. LORDAN: I found that a lot of your priorities are similar, independent of the scenario, which either was optimistic -- you know, was good or bad, I don't know how to look at it. And so that's why I tried to stretch the model a little bit. So maybe there is some things in security that will emerge that will be helpful. So maybe we could talk about that.

The second thing, and I'll be brief, on your product prioritization, I either wonder or I wish that there was some more objective criteria applied to the products. It seems like the product mix was right from a subjective, it seemed like you had the right things in there. But I wonder if we could include the cost of development, some cost of implementation in the value of that product, versus the risk or the cost of not applying it and some probability of technical success in the R&D. And you know, is -- what are the probability of if you don't do it, you know if manufacturers will take the space or someone else will. So I would offer that as a suggestion.

MR. ETO: That is a good suggestion. I

think that's really what Linda's job next will be all about. In that you know, I think the work, at least my understanding of the work that I was tasked with, and I think for Rob Shelton as well is to derive inputs, you know, gather information, gather some thinking. And maybe a slight -- we weren't asked to prepare the proposal or the R&D plan, but instead priority at a very high level of aggregation in many cases compared to what you would actually implement in terms of a specific project or an R&D focus activity. And that is, in fact, the hard word that remains to come.

MR. MYERS: Bill Myers with the Valley Group. Joe, I'd like to reenforce or comment, expound and question a little bit one of the central issues of your presentation, which is the need for improved returns and increased regulatory guarantees for transmission system investment.

The CEC has funded two earlier projects regarding real-time ratings of overhead lines using our Valley Group technology. I want to be as brief as I can, but I don't know a better way to do this than to quote a brief paragraph. I assume that everyone here is aware that FERC has docket No. PL031-000, which is the proposed

pricing policy for efficient operation and expansion of the transmission grid.

Tab Septe of the Valley Group couldn't be here today, but I'd like to again, quote just a brief paragraph that he made to the FERC Commissions. And it reinforces what you are talking about. Adequate incentives for increasing the capacity of transmission lines through innovative technologies do not currently exist. And technologies that provide real-time rating of transmission facilities will not be widely or quickly implemented without properly tailored incentives.

As key innovator in real-time rating transmission lines for the past twelve years, the Valley Group has seen this from firsthand experience. Still, the best technologies have been slowly implemented based on their own merit, even though the current system often provides disincentives to innovative solutions, while rewarding conventional approaches based on rate or return.

To encourage the use and development of these technologies it is vital for the Commission to reward the quality of benefit provided, not

just to reward the most expensive investment or rate of return. Innovative solutions in technologies transmission congestion are readily available but they will only be realized under an improve system.

We believe that the current FERC pricing policy if properly designed can be a landmark step towards implementation of these available innovative solutions that can reduce transmission congestion in all part of the United States.

He makes three specific recommendations. I'll provide a copy of this to you if you don't already have it. But I guess my question to you in comment, is a part of this project and this process to try to actively work to impact this decision in this process?

MR. ETO: Not to my knowledge. I would like to maybe respond to the subject of the comment though, which is that, you know, if there are not financial rewards for improving performance by whatever might be the most cost-effective, then all the R&D you might do is more or less an academic exercise.

And so again, part of the tailoring of these scenarios was to clarify and sharpen some of

the incentives that do or do not exist to implement solutions to our transmission problems.

It's one of the reasons why we moved toward postulating a PBR framework for IOU ratemaking in the 3rd Scenario, specifically to provide an opportunity where those who owned the assets would have the incentive to improve the flows that those assets might be able to carry and directly benefit from it. Because otherwise, R&D to help that end is not going to lead to implementation if there is not a value being seen by the ones that need to make the investments. So I very much agree with the sense of that comment.

MR. MYERS: Thank you.

MR. MINNICUCCI: Hi, my name is John Minnicucci and I work for Southern California Edison. First, I'd like to say thank you to the Energy Commission for allowing us to give input into this process, which I think is a very important process and will allow us to make significant strides in the future. And I'd also like to thank you, Joe, for putting together something that was very readable, and what I think is a pretty good discussion document.

The one thing that I am seeing in all

four scenarios is that transmission will continue to play a major role in the California context. And I see that the transmission and planning and expansion tools are rated as a very high priority.

But even if you can come up with a great tool for planning and expanding your transmission resources and you can come up with the market to satisfy the requirements, the financial requirements to build these resources, I don't think that you can really get there unless you do the public, health, safety and environmental research necessary to overcome some of the interests involved in the permitting process.

And I'm not sure exactly how we're looking at streamlining and how we're looking at, you know, creating this expansion process without understanding that there is a, you know, there is a major environmental issue component to the question. I was wondering how you might address that?

MR. ETO: Sure. I essentially agree with the just of your comment, which is there is absolutely a role for public interest work to be done to address many of these public healthy, safety and environmental questions. And I am

hopeful that appropriate agencies will undertake that work.

I indicated it is essentially a second tier priority that persisted through all of the scenarios. Because I think it is really quite fundamental and something that is uniquely in the public interest. I think a lot of the discussion that we provided really spoke less to the importance of that work, but more or less the role of PIER ESI transmission in supporting that.

There are many other PIER activities that have a role to play, even within ESI on some of these questions. And so we didn't see it as falling neatly within the scope of, for example the kinds of things that we saw as highest priorities under each of the scenarios, but I would not at all question that they are priorities.

MR. MINNICUCCI: One other comment I would like to make on that issue, is that there is a lot of great research being done on environmental issues. But I think a role where we can play in this transmission focuses area, is that you can coordinate the different areas that are conducting research and focus it on

methodologies, and I guess approaches to allow, or just focus it on the transmission perspective, versus just having it done in general.

I think that, you know, we can play a role here to focus on what needs to be done to enable us to site more transmission facilities. Thank you.

MR. CORLETT: Jim Corlett with San Diego Gas and Electric, that other utility. I'd like to actually use your discussion format here and address a couple of questions. Your second one, and I guess I'll paraphrase this for those on the webcast so they know what the question is, but it deals with the assessment of transmission R&D needs for the scenarios, are they accurate and complete. And we wanted to kind of emphasize, from out standpoint, the significance and priority that should be given to increased transmission asset utilization.

And what we're thinking there in terms of, we need to really take a, put a lot of priority we believe on the hardware involved in using the existing transmission corridors that we now have, fortunately we have, in order to tweak out more capacity in any way we can. Whether it

be exotic conductors, composite towers, insulators of exotic materials, anything that we can do to wring out more capacity in that existing corridor.

And we think that's a very, very high priority, very practical in this environment in terms of trying to get the most out of what you have, rather than trying to build -- we'd like to build more, it's difficult to do. We have had a problem with that recently ourselves.

So we really think you need to try to do everything you can in that area. And there is a lot of interesting technologies going on there.

And then I guess the other one would be question 5, which is what other factors should you consider developing R&D activities? And again, I think it's probably along the same lines, and that is we ought to be looking at trying to increase, you know, look at the short-term benefits of increasing existing transmission infrastructure.

It's something that can be done in a reasonable length of time. It's obviously needed. We think the capacity is required. And it's something that we can do right now.

So we want to make sure that we take a

look at those kinds of priorities. Thank you.

MR. ETO: I guess I would second the comment that the reality today is that it's very difficult to build new corridors and that we are really in a situation of trying to get the most out of the existing assets.

And I think there are, you know, several different ways to do that. And we ought to prioritize them based on the greatest value that they can offer. In our assessment, we thought that that had to do with smaller investments in software and monitoring kinds of technologies in the very, very short run.

MR. FIGUEROA: Hi Joe, Al Figueroa from ESC Consulting and I too wish to commend you on the excellent document you put together as a starting point for the R&D that's required in this area. A couple of points in following up with what Jim just asked about, the asset, improvement in the efficiency. We have to keep in mind that improving the efficiency and useability of existing facilities can only -- so much.

And at some point in time we're going to reach a limit that we're going to still need to

have some new infrastructure to be brought into place and I think we need to address that in each one of the scenarios of how to facilitate, or what kind of research to we need to do to facilitate that process. Because notably, we are going need some new infrastructures.

The other point that Rich made mention to, and that is in a catastrophic failure. There are two points in here with respect -- that I would like to make in respect to that. One of them, is I would like to see some mention in either one of the scenarios about research for quick restoration of transmission facilities in the event of a catastrophic failure.

And also, inputting the economic impact to the State in the case of each one of the scenarios, should it go or should it fail? Thank you.

MR. ETO: I think I just want to respond to the questions. On the first question about better, you know, limits to better utilization of existing assets, I think that's absolutely correct and it's under each of the scenarios, in which there is an opportunity for new investment essentially. We were trying to think about what

kinds of R&D work consistent with that kind of vision. But clearly in the current state that we are in, that's not happening. And that's why were forced into the priorities that we were forced into.

MR. TORRE: Hi, my name is Bill Torre, I'm from San Diego Gas and Electric Company. I wanted to follow-up a little bit on some comments regarding the priorities. I noticed that in your analysis, which I thought was very good, I enjoyed reading your publication and the approach you took with the scenarios. But I noticed that on all the scenarios you came up with market design as a fairly high priority and the hardware side of it is a fairly low priority. And from listening to your discussion, it sounded like you made that decision, mainly based on the cost point of view. It didn't sound like you looked at the benefit side of it necessarily.

And one of the things I see and from the transmission point of view is that the hardware side of it is where we make investments in the hardware, we can better utilize existing transmission system, either in applying new types of conductors, or i.e., high temperature

conductors, or ways to increase the structure capacity so we can actually reduce the sag and increase basically line tension so we can increase power-flow capacity.

On the market design side of it, I know we've been studying market design for last eight years, or ten years or whatever. And I'm not sure that the investment there from an R&D point of view is one that's going to result in near term benefits. So, that's just my comments I wanted to add.

MR. ETO: I'd like to respond to both of those, and again, I think I want to make a distinction between transmission R&D that I think is absolutely in the public interest, for which I would include both of those activities that you mentioned. And transmission R&D that might be uniquely supported by a public interest R&D Program such as PIER, in which, and I would like to differ with you on a comment that you made about market design size.

I think it's precisely because we didn't study and do due diligence on testing markets before we found out that we made a mistake, that we are dealing with the problems that we're

dealing with here in California.

And the recommendation here is to get smarter and test, monitor and fix in real-time these things before they run out of control. And that's exactly what didn't happen and that's why I believe that is a unique priority that only a public agency like the CEC can undertake.

With regard to the hardware question. Yes, I believe there is lots of transmission R&D in hardware that's extremely important, but what I was trying to clarify in the assessments under each of the scenarios were the incentives of different market participants to undertake that R&D independent of, or in the absence of the kind of support that a PIER Program might provide. And that's the basis upon which those priorities were establish.

So it's not at all to suggest that that's not an important activity, but it's also to sort of suggest that within the large set of priorities, those that might be uniquely supported by PIER come out of an application of those criteria and considerations that I was asked to work with.

MR. EVANS: Hi, I'm Peter Evans with New

Power Technologies and I would also like to echo the comments of others, thanking the Energy Commission for the attention it has put to this issue, or this set of topics, because I think it's urgently important.

I just wanted to offer a very brief comment on the one scenario, The Emergence of Local Solutions. I'm not sure if I'm reading more into your words than what's here, but I guess I would encourage you to think of emergence of local solutions as not something that happens externally that may effect priorities and transmission R&D, but something that ought to occur part and parcel with development of more effective and more higher performing power delivery network.

You mention this in your research priorities, the integration of transmission and distribution planning, certainly that goes in that direction. And I guess I would simply suggest that you also, in your research priorities consider some legitimate research into, the real extent to which local solutions can, in fact, represent alternative solutions to a given set of transmission problems, true wires versus non-wires comparisons and research in that subject matter.

MR. ETO: Let me respond by suggesting that it was my intent to try to reflect that type of work as being of a high priority and that scenario, and if it wasn't clear that's a point that I'll take.

One of the challenges in that area, was that it really does touch on an area that the Commission tries to address right now through its DER Program, and so, yes, we should mention that how the Commission chooses to address it, is yet to be decided. There is work on those kinds of questions going on on both sides of the ESI programs on these two areas.

MR. AHMED: Syed Ahmed from Southern California Edison Company. I have been involved in research for the past twenty-five years, power system research. Basically, the priority is for real-time grid asset monitoring and analysis tools, advanced real-time control approaches, with the advances in computer technologies for the past 30 years we have been doing it.

Yes, a lot of work has been done and still a lot of work is needed. But, the bottom line is, that in the end it is the same conductor which needs to conduct the power. With the

improvement in the monitoring and control, we can probably increase the power throughput, the same conduction, maybe 10 percent, maybe 15 percent. But with the five-year scenario what will happen if the growth will take over? The bottom line is the conductor and the infrastructure, like circuit breakers, they conduct the power from point a to point b and those need to be improved.

In the past 30 years what has happened that yes, a lot of work went into this, because the computer advanced and the computing power exponentially. But little work was done on the conductor, on the interruption capacity of the circuit breaker, the splicing of the conductor. Because this is ground to earth technology, which had been around for a long time and no investment or very little investment was made.

With the five-year scenario for an immediate payback, I feel that the transmission hardware and power-flow control technologies in which there is conductor, the circuit breaker, the power transformer will have a better and quicker return.

And the PIER program basically, as per my recommendations, that's what I feel, should

emphasize much more because we will be able to invest very little money, comparatively and get a high return. Thank you.

MR. ETO: I'm not sure I know what the question is?

MS KELLY: I think it was just a comment.

MR. ETO: Okay, fine.

MR. RODRIGUEZ: Good morning. I'm George Rodriguez from Southern California Edison Company. Joe, I also want to tell you that I think what you did here was exemplary. I think what you did here was exactly what was needed to be done, the scenario analysis is what we do internally as well in our company, and it works very well, especially in unknown futures.

A couple comments, first, one is, is that scenario analysis really takes off of what is and what's been happening versus where you want to be. I was hoping to see that the CEC would take more of a leadership role in deciding for California where it wanted to be in the energy business, meaning around generation, meaning around transmission, where we're going to be, how we're going to operate it? And then look at what

needs to be done to get there. So what we're doing is saying, like, what are we being -- what is the environment going to hand to us as opposed to what are we trying to define as our future?

Now I'm trying to do that in a different way here at Southern California Edison, meaning where do we want to be? And we take that approach, the priorities change a little bit differently.

But oddly enough or ironically in regards to the scenarios and in regards to what you do, we come up with the same kinds of technologies, the same categorization as you've had, so there is no question about that. That's very good, that's why I like it a lot, because I can see that these are the things that we need to do.

However, when you look at what you're trying to do, especially in your prioritized tools for CEC, which are basically monitoring, analysis, evaluation, those kinds of things. What you're really doing is overlying a control or a monitoring strategy on an existing conventional transmission system that's one hundred years old in most cases. And not looking at what do you

really need to do to get this transmission system up to par to meet challenges of tomorrow.

That transmission system today as designed was not meant to be in this kind of play, this kind of a scenario. It was never done that way, so what I'm trying to say is, then why don't we look at it in terms of what it should be if we're going to have an RTO, a free market, and you'll come out with a different kind of a system.

Now that get's down to the bottom point I think has been echoed and I don't want to say it again, but I want to emphasize that when you really get down to what it means to enhance or to increase capacity. You're really getting down to the components of the system. You're looking at the transformers, you're looking at breakers, you are looking at some very mundane ordinary stuff. Conductors, you're looking at insulators. These are the things that we invest in. These are the things that we make better. These are the things that are going to improve the capacity of the system.

You're monitoring tools, all they're going to is just look at them, the existing system today and buy you 10 percent. Yes it's cheaper,

and the cost fits well within, you know, the CEC budget, but it only gets you 10 percent and at most it's a delay tactic. Because you're going to have to invest in something else.

Whereas, if you go toward the harder realization that you have to invest in things like fax devices, storage devices and other kinds of like solid state devices for the future. Yes, they're costly, but the benefits are huge. We're not talking 10 percent. The new conductors that we're looking at right now are not in a 10 percent bracket, we're talking about in the 200 to 300 percent increase range in capacity. And the kinds of control devices that we're using, like for instance the Thyrister Series Control Capacitor banks could increase, we're talking several hundred megawatts, we're not talking about 10 megawatts here, or whatever.

So, if we're really going to make an impact on the energy future of California, then I would propose that you look at the future, more than you look at the past and what it's going to be.

And then my last comment is on the assumptions there. I mean, I would love to

believe that in your Scenario 2 and Scenario 3, that the utilities become financially sound, number one. And that we have all this great internal R&D funds to do what we want to do. I don't know where we're going to get those funds from.

But believe me they're and not coming anywhere and they are not coming soon. Unless you go back to the old days, which I was a part of by the way, of the R&D balancing account type of mechanism or whatever. But that's not going to happen. I don't see that happening and R&D funds are going to be controlled up here and we have no way to write off R&D because we don't an official -- it's all under O&M.

So I was kind of wondering how you got that assumption and where you think the money is going to come from. Because I don't know, I would love to believe it. Thank you.

MR. ETO: Your points are extremely well taken George, and I really appreciate them. And I'd like to speak to them a little bit. I very much agree that the scenario approach, because of the guidance we were provided, is not by design intended to be an articulation of where we would

like to be. I do think that that type of planning has a role.

Scenario analysis has a role in far more than R&D planning, that's certainly for sure. And so I second that comment and I think that having a sense of, you know, what those directions are is a much larger question than this R&D planning process. And I encourage my colleges at the Commission, I know that they are hearing those discussions.

The questions with the size of its investments is very well taken also, in that one of the assumptions that I wasn't as explicit about is a presumption that the PIER R&D funding for these types of activities would continue at about the same level.

And we don't see, you know, PIER undertaking, you know 100 million dollar demonstration projects as an outward extreme example. And in fact, and I'll speak to your last point specifically, that's why in some of the latter scenarios and I will speak to this question about the IOUs being more financially healthy and able to undertake internally supported R&D.

We saw the CEC rules leveraging those

activities, not leading them. And I think part of it really is the significant resource requirements that's required. Appropriately so, to undertake these kind of quantum leaps in some of the technologies that we're talking about.

I think the comment about whether R&D funds are or are not available for IOUs to undertake this research is a very serious one that needs to be addressed by the regulatory commissions that you operate under.

One of the reasons that we structured the final, excuse me, the 3rd Scenario to have a PVR for the IOUs was to allow a way essentially for the company to see a return from what is currently kept off-line of the O&M and not, you know, the O&M right now, if it can't return in a year is not going to do you much good given the way the O&M accounts are structured.

But a PVR mechanism in where the benefits of that return, we've seen this take place in other jurisdictions that have adopted these kinds of things. And so again, part of this, moving back into having IOUs do R&D involves, I would say, regulatory changes that make it profitable, that make it in the business

interest of the company.

And that's something that's going to be quite different from what I think is -- were the old days of a balancing account for R&D.

MR. O'CONNOR: And I'm here to address that assumption regarding that last scenario regarding that the utilities should implement a PVR to do internal TND R&D.

I think that assumption varies from the legislative intent from the legislation that created this process of looking how to implement an IOU TND R&D Program that previously was under the auspices of the PUC in a very small balancing account. And that legislation transferred the oversight of that work over to the CEC. It did not internalize it to the IOUs, that's why the IOUs are here today. And why they've been talking with staff.

So I would suggest that you go back and try and align the assumptions with the legislation intent. Thank you.

MS. KELLY: How many more questions? One, okay, because I'd like to keep on schedule we're a little behind, but please come forward and then we'll conclude and go to lunch.

MR. HAMMOND: Good morning. I'm Richard Hammond with Optimal Technologies. We're new players in this transmission community, and want to thank you, Joe Eto and the CERTS Program and the laboratory and the Energy Commission. And in particular, we have been participants in two important initiatives that the, I also want to thank Navigant and Rob Shelton incidentally.

And I do want to add my voice to the chorus of applause for the table setting that you've done here today in framing these issues. You obviously have brought forward a number of points of view. These are all part of the dialog that's been going on and that is becoming, I think more informed, more intelligent as the grid, I think, itself is trying to become more intelligent.

And my gratitude for the R&D Program also stems from the participation in a CERTS Energy Commission sponsored, CA ISO sponsored study of the June 14th, 2000 events. We were very pleased to have the opportunity to give an additional interpretive perspective on that particular set of events that had acute transmission and distribution system constraints

and outages.

We also are part of the Energy Commission Distributed Energy Resource Initiative Study at the Silicon Valley Power Municipal Utility that Peter Evans of New Power Technologies is a part of, and we're very pleased to be part of that.

Our perspective here, that we offer is some reinforcement of points of view that I've heard and read in the papers that have been produced here today.

We take what we think is a common sense perspective that the existing system is problematic as it is as piecemeal in it's conceptualization and construction as it is, is what we have to work with at the moment.

And the challenge that we all face is, how do we initially do two things with that system. One, wring as much efficiency as we can out of that part of the grid. When I say grid, I think in terms of, our company thinks in terms not just the transmission grid and not just the distribution grid, or even the two combined, but those two together with all of the generation and together with all of the load, that is our system.

Ideally, we would like to find interplay among all of those elements and across all of the borders of those elements that allow for the very advanced computational exercises that need to be done to wring these efficiencies out.

All of the efficiency effort that the State of California has put in from my point of view, over the last 25 years has been on the customer side of the meter and on the generator side of the meter. And I shouldn't say all, because that's not fair, but there is a great deal of mystery still about what goes on between, that the connections of generation to the transmission grid and the actual service to load.

So across transactions distribution, we all know, we can stipulate that there are very large losses right now and we want to try to narrow those losses. We want to eliminate congestion. We want to eliminate low flows and so on as a community.

How do we go about doing that? Well, what we think Mr. Eto has put forward and others of you here in terms of better understanding and then being better able to respond to this entire grid. That's a combination of more monitoring and

reportage and analytic tools software. But ultimately, it's also a question of well, how quickly can you respond to these new data points that your getting from the advanced monitoring? Do you have something that allows you to identify these problem points and to generate solutions.

Now, briefly what kinds of solutions? Once you have this more intelligent smarter, more responsive grid, we see three or four tiers of possible solution. Just very quickly I think people with different points of view coming forward here this morning have identified very legitimate inputs into each of those.

From our point of view, the very first thing that you would do would be look for recontrol opportunities with the existing hardware that you have.

The second would be, what can you do to make affordable, non-invasive very short time adjustments in the hardware that you actually have. A capacitor here, a change in location of transformer there, that kind of thing. Because we believe that there are in the aggregate very significant additional efficiencies that you can get if you have good information about where the

next adjustment will have the most value.

And then finally, with respect to whether it's new generation or whether it's advanced transmission hardware, new technology. You should be able to know as transmission system stakeholders, what is going to be effect, not just within the immediate locality, but region-wide and then network-wide. The largest network that you can describe and efficiently function with your software analytic tools, what is going to be the net effect? And it can be a series of net effects inquiries that you can make, local, regional, larger regional, statewide, WCC, grid-wide.

And we want to second the notion that if you have a transparent grid, that all of your additional improvements, whether they are regulatory improvements or whether they are institutional, getting the IOUs to really actively work internally across their transmission and distribution networks and their load management programs.

And getting the full array of new hardware developments so that you know what is the net effect of each smaller increment of change, whether it's institutional software, additional

software or additional hardware. Thank you very much.

MS. KELLY: Well Joe, that was a very good presentation. I really appreciate you answering all those questions. Thank you very much, it was a good report.

(Applause)

MS. KELLY: We're a little bit off schedule, but not too much. But before we break for lunch, there were a couple of things that I just basically wanted to just cover. During the morning I heard a lot of discussion about scenario analysis as a result of Joe's work.

As I said, it is just one tool, but it's a really valuable tool. And some of your questions and comments seemed to elude to the fact that it should have been expanded, or we should do it in a different way. For this exercise, we did limit Joe and for purposes of time, this was a limited scenario analysis exercise.

But, if you think that it is important to do other scenario analysis work and you think to develop other issues or to develop a preferred scenario, please feel free to put those words into your comments.

And then with regard to comments, Joe mentioned welcoming from Dave Hawkins and others suggestions about what we might include or not include. I would hope again, it's no longer pen to paper, but finger to keyboard. But we would really appreciate as the afternoon goes on when you're done, that you think about what you heard today and then let us know what is missing.

Because this afternoon we'll have the second part of this. And this is going to be a research assessment, which is just by the nature of its design, much broader. But when you're finished this afternoon, then you should have a very good idea of what we think are the key issues and the key research initiatives that we will be looking at.

And if anything is missing, I encourage you to not only come here and make comments and we will include those, but give us more information about those comments so we can make sure that all your concerns and all the issues that you have are included when we finally put this together.

So we are a little bit behind schedule, btu we have a very full afternoon, so if we can see everybody back here at 12:45. There is a

handout that lists some of the places to have lunch here in the immediate area. Thank you every body.

(Thereupon a lunch break was taken.)

MS. KELLY: I think this afternoon the agenda this afternoon should help bring together in everyone's mind the work that we set out to do. The first part of it was the scenario analysis, and this was one of the tools that I kept mentioning that we use, but it is not the only tool that we are going to be using.

The second tool was a research assessment. And as I mentioned this morning, we have two major reports, the second is this research assessment. And the research assessment really just looks at the way research is today. They look at what's being done, what is being planned and tries to assess what the State of the industry is today.

Rob Shelton, who is the person who did this research looked at what the research was, they did a gap analysis and for the purposes of this particular Workshop, what we attempted to do is to identify some preliminary opportunities. These are not recommendations. In fact, this

product compared to Joe's work is probably a little less far along.

We will get input from you people today to complete the research assessment and the gap analysis. And then what we'll do is we'll develop a portfolio that is responsive to public interest criteria.

So Rob will be looking for input from you to see, what did he miss? What needs to be refined? What needs to be tuned up? And will be definitely looking for your input.

Let me just introduce Rob. Rob Shelton is part of the Navigant team that has worked with the Commission here to do the research assessment. Rob is part of a team. Forrest Small, who is lead on this team is back in Boston waiting for a baby to be born, his first daughter at any time. So he is not here today, but Rob Shelton has agreed to takeover for Forrest. And during this presentation he'll be assisted by Peter Mackin, who has been working as part of our team as well.

I think I'll just get right to Rob because he has a lot of information to cover and to go over with everybody. And as with this morning, what we'd like to do is first, go over

the methodology. If there is anything about the methodology that you have questions about? Rob will take a break there and ask for clarifying questions.

Once we have those out of the way. Then we'll go and start looking at the result and looking at the opportunities that Rob has identified and get your input about whether you agree with these opportunities or what you would suggest be included as well. So, Rob.

MR. SHELTON: Thank you Linda. Commissioners and staff and stakeholders, I'd like to get right into the substance of the presentation in order to get the afternoon moving.

We have three objectives in this particular presentation. The first is to describe the methodology as Linda just mentioned, used in the assessment. The second is to present the findings and observations from that analysis. And the third, and I'd like to draw attention to this is to generate valuable discussion regarding the key issues, the selection criteria for investments, the forces that you think are pertinent to consider in developing and R&D portfolio on in transmission.

I characterize this as generating constructive conversations regarding the current status of transmission R&D, the role that CEC PIER should play in future R&D. I will emphasize at this point, this is not the time for detailed analysis or changes.

If you have a comment regarding how one of the several hundred R&D projects that we looked at should be categorized, if we've made a mistake in wording or something, that's best done via e-mail. There is not a sufficient format for that today. It would wear on my nerves and possibly the others as well. So we will try to get that information and it's critical we want it, but handle that type of input via e-mail please if you haven't already.

And we'd like to deal with it at a more general level around the issue of making the right decisions regarding a Research and Development Portfolio.

The methodology we used includes a framework for analysis, some specific analytical tools and some processes. The purposes in presenting it here is to make it transparent so the results can be seen for what they were

relative to the state of development and the analytical process used.

The goal of this particular R&D assessment, the goals are to support overall CECs PIER's development of a five-year research plan. Characterize the research objectives, the scope, the budget where available, the timeframe of research already performed, underway or planned in the transmission area.

Secondly, to identify and prioritize the research gaps the CEC could address with this research program and to develop recommendations regarding the research portfolio. So while Joe Eto's and CERTS analysis was very much a what if analysis of what the future could be. This is an assessment of the current status.

It's a what is assessment. And it addresses the current state of R&D activities, as well as the potential opportunities for CEC and leads to recommendations.

This describes where we are in the process, we are at the fourth chevron in the Workshop and that I believe is an important point. The work to date has been prepared in order to get us to this point. To present the information, the

interim results to let you see the framework, consistent with being transparent and then to get input.

Subsequent to this, we will use the information from the Workshop to refine the results, to develop recommendations and put that in front of the CEC PIER staff.

Our development of the information went with three tasks, information gathering, which we conducted literature and web base searches. Importantly, we conducted interviews with what we called research hubs, those are areas that are conducting large amounts of significant research and transmission and important stakeholders. Let me give you a list of some of those, and I believe I've got a complete list, but the research report provides all of this and I'm sure you all will read it if you haven't already.

The hubs and stakeholders included BPA, CERTS, CA ISO, DOE, EPRI, ORNL, TVA, UC Berkeley, ABB, American Superconductor, Wakishaw, SCE, Sempra and some Navigant capabilities and insights as well.

We developed the data into a framework that I'll present in a second and show you. And

then we made the initial assessment. As I said, that's where we are, we're in this Workshop and we're looking for input from you.

While I said that we weren't interested in details, let me be very clear, not interested in details on the wording or the exact classification of projects that may be in here, not in this Workshop. We'll get that from you from e-mail. Most interested in things such as selection criteria for choosing R&D projects.

Most interested in understanding the scenarios that you think are most important to consider relative to selection, this is a risk hedging and diversity that have to be included. Those are the types of issues that we're looking to uncover in this particular activity.

Now, our activity is represented here with the five chevrons, is only one of several that will go together to create a CEC investment plan for transmission R&D. The CERTS scenario work has already been presented and likewise inputs from this Workshop will be used to refine and finalize that. and specific input from stakeholders, you in particular in this Workshop and later will be used.

So what we have is a bottom's up assessment from the Navigant Project, a top down assessment from the CERTS scenario and specific input from stakeholders that will lead us to the development of the CEC investment plan. Ultimately this is meant to lead to managed development and management of a portfolio of investments and transmission R&D.

It's worth commenting that a portfolio, which is often thought of as a financial investment tool has also been used for research and developments and certainly since the '80s and '90s.

It's a very well respected way of managing the inherent risks, uncertainties, ambiguities, the need for tradeoffs, covering multiple objectives and that's what we mean by a portfolio. That's the net result of all of this. So, while we're still in the early stages, somewhere back in that fourth chevron, we are aiming towards a portfolio the CEC will manage through to completion.

A couple of observations seemed appropriate at this time, since we're talking about R&D. The transmission industry is not just

like every other industry. We heard comments about that today and some of the forces have been described in the scenarios and certainly in some of the discussions.

They're a unique set of characteristics, and these are not meant to be positives or negatives, they are simply observations. One, there is a relative lack of historic competition. This is a very large important part of the North American Infrastructure, but this hasn't necessarily been an area where there has been strong intense competition.

Second point is participants often appear risk avers and conservative regarding investments, again, neither positive or negative. There are lots of reasons you can ascribe to that.

The third is the transmission industry is relatively mature, and that's again a relative thing, relative to some industries it's not as old, but relative to the technologies you've heard mentioned and the fact that things have been in place one hundred years and some of the technologies haven't changed appreciably. That's important to consider in looking at the R&D portfolio.

And finally, research has often taken place through collaborative efforts and research consortiums apparently sharing both risks and rewards and costs. Something that is not on here, but is inferred from this and it was mentioned earlier is that overall, R&D funds in the transmission area appear constrained. Funding is down, folks are not seeing wide open budgets with lots of spending. And so we find ourselves, or the transmission industry finds itself in this particular situation.

And the scenario work outlined, the different futures that could emerge from this current snapshot. It's not to say this is the future, in fact, this isn't possibly the best representation of the past. The future does not have to be like the past, but it's worth noting where we're starting from.

We did use a methodology that's entirely consistent with this type of industry structure and R&D spending to gather and assess the current status of R&D and to identify the gaps.

This is the taxonomy of research and development we used. It starts with a fundamental premise that there are issues that the

transmission industry faces. These issues are motivators for change in such things as threats and opportunities, there are strengths that can be built and leveraged there. There are weaknesses that need to be dealt with.

And I think that the scenario work this morning did a great deal to unpack those particular threats, opportunities, strengths and weaknesses. But these are motivators. People don't operate at that level per say. They look for ways to create research initiatives that will make improvements along such things as making things better, faster, cheaper, more reliable.

All of these issues were at least touched upon in today's discussion. Those are the basis for research initiatives as shown here. So issues motivate people to create research initiatives.

But the area of transmission is so broad and so complex that you find research initiatives falling into four areas. Now, we made this taxonomy after looking carefully at the current research and development and historic research and development. I'll give you more details on it, but I wanted to show you the four here, component

optimization, capacity additions, advanced systems operations and markets.

So issues act as motivators to create research initiatives which we've categorized in these four areas. We've made the key issue and the four research initiatives into question since that's often the beginning of any R&D program or R&D initiative. These are not technologies per say, notice, these would differ from the CERTS scenarios piece which tend to have a technology focus. These were more around different types of issues that people face.

The first is component optimization. Are there technologies that can increase or optimize the capacity and reliability of the existing transmission components? Just to pause for a moment, there were several that spoke in questions and comments, bit of an exchange earlier on on the issues around component optimization and increasing the efficiency of the given system, those are the types of projects that we're talking about. By the way the report lists these in great detail. All of the projects and the details are listed there. It's a little hard to go into all that detail here.

The second, capacity additions, are there technologies that will provide a quantum leap in transmission capability or simplify adding new capacity? So that's different from improving what exists, which is the first. This is significantly adding new capacity.

The third is advanced systems operations. Are there technologies that can increase transmission capability through advanced information management and control of the power system? A little bit more towards the software management side of thing as opposed to the hardware component.

And then, a fourth piece that's an integral part, but a little different than the other two called markets. Can market models or operations be improved to encourage transmission investment or optimize transmission resources.

So our starting point were good questions. These are the questions that we saw, we heard reflected from the R&D participants that we interviewed. I gave you the list, at least a partial list there. We gathered information from each one of those. And we identified the R&D projects that were publicly available.

There may be in some cased groups that would not wish, particularly in the private sector that would make wish to make something available because of competitive advantages. But we took all publicly available information and we assessed which of these focus areas they went into. And then we organized them into initiatives.

And I'll give you an example of how we did that. For transmission for component optimization we too took this question and just to give you an idea of some of the comments we heard from R&D participants. "Transmission congestion is an economic element that consumers pay for, certainly a motivator for cheaper or better." Another one is, "Nine out of the last ten outages were do to voltage instability. Los Angeles is a disaster waiting to happen."

Well, these were simply indications that people were concerned, their motivation was high. These were not considered academic or interesting questions, these were considered fundamental to operation of the transmission system.

So we took the key question in component optimization and said that's very broad question. We broke it into key sub-issues and we identified

the research initiatives. Here are the issues and the research initiatives that we found you could break component optimization into, or sub-categorize it.

Not worth walking through every word up here again, I'm hoping that all will have read or will soon read. But, I will point out that the research initiatives on the right, there is a second page here I'll warn you are the ones that we used as the organizing principle under component optimization.

Ratings and operating limits, these were areas that we found current research and development ongoing and these were the sub-questions that people seemed to be trying to answer, or issues they were trying to address.

Equipment reliability and availability, system reliability and security, system restoration, self-healing networks, improving fault location, automated repair and equipment efficiency. I'm not trying to -- I don't want to over stress things, but I heard mention of all of those in today's earlier discussion, at least some in greater detail than the others just as a way of saying I think that there is great concern about

this particular element. And I think that you'll see component optimization to be on the screen of many who are wrestling with transmission R&D issues.

And we'll go on. I'm going to describe methodology before we get to reports, so if I don't wear out your methodological interest before we get all the way through this, you will start to see that this is a very important area.

So let me remind you again, issues act as a motivator and initiatives are the response to that. Now the next area is capacity additions. And here we found these three research initiatives, system upgrades. In answer to the question, can we upgrade system elements to increase their capacity as in the voltage conductor. Systems configuration, are there novel configurations to increase capacity? Can we site, permit or construct new facilities? Those kinds of questions lead to systems configuration as an area of R&D.

And then new components. The question or the quotes that we found here among the participants are worth noting. Let me just give you a couple and again these are contained in the

report. "The biggest issues are lack of sufficient transmission capacity, justifying new transmission addition and the issue of who is going to pay for the new additions."

Another quote, "Transmission capacity is not keeping up with increases in load or generation. The industry structure does not facilitate investment. Communal transmission planning and investment are not coordinated with private investments and generations. These are basic conflicts."

Again a note of importance relative to the R&D, this is clearly again not an issue that was academic to those involved with this particular area.

The next area is advanced systems operations. And to show you what falls into this area, we'll list these two research initiatives, systems operability. Trying to address such questions as what are the practical limitations of transmission size and scope? And what would be the anticipated values and benefits of improved systems operations?

And then operating information. How can we improve the quality and quantity of operating

information? Again that was mentioned before. It's a rather fundamental aspect of a complex system that appears to be getting more complex. So this area is one of R&D that is also very important.

Then we hit the last, which was the markets area, which we're looking at market models or operations to encourage transmission investment. The areas here, there are three actually. Market design, addressing the issue of our current market designs inhibiting the development of new transmission facilities. Market operations, looking at specific tools and information to improve market performance and look for optimum balance between the players.

And business models. Very interesting area about is the level of risk or perception of risk preventing development of new transmission facilities? Can transmission systems provide a broader range of products and services? A whole set of issues around how markets are to work.

Now markets are a different kind of beast than components or software. And we can all sort of imagine R&D that's a traditional place where you have labs and people doing work. But

markets are amenable to R&D. If you can imagine such things as models built that will help folks understand both off-line as well as on-line what's going on, what could go on. Potential benefits, trade-offs, risks of trying different approaches. Trying them off-line is far better than trying them on-line and I state the obvious there.

But there is a huge amount of uncertainty. And this is a bit of a moving target, because as we probe deeper, you know, I think that everyone could understand that the transmission system is complex, the markets and regulatory situation is in flux.

People are trying hard to get a handle on which way to go. And there are strongly different opinions, but not always good backup information, good analysis, risk analysis or the like. But even with all of that, some folks have used their models and made decisions to move forward and run into problems that weren't anticipated.

For instance, the New England ISO is implementing the new market design based in part on, well primarily on the FERC SMD. And they did their research, they made their decisions under

the best of available information and models and implementation has been painful according to many that have been a part of that.

And therefore, they need to go back and look at some new analytical tools and processes to help them understand unanticipated outcomes and the like. So this is one of those situations that as you refine it, you may in fact uncover additional work to be done. This is an area of importance based on, again what we heard from those that were participating. I'm very much feeding back to you a structured way of representing what we heard people say.

So, that's where we stand. I think it's interesting to note that we found research activities, projects in every single one of those. It's not as though we created boxes and said that's a good topic. We in fact found projects in every single one of those. Interestingly, current component optimization and advanced systems operations were two of the areas where there is the greatest amount of current R&D.

Now, don't read too much into that. That's a simple observation of where things are today, not where they should go, not where they

have to go, just gives you an idea about where things stand today.

Now, projects were put under each one of those initiatives, you can see some are receiving lots of attention, some less. Well talk about how to interpret that information in a bit. But we're not done yet. I mean we could have sort of stopped there. There is a multi-billion dollar area called transmission R&D, there's the taxonomy, these are the projects. And we could have said okay. But we decided to push the boundaries a little bit more and push analysis and go a step further.

So we took all of those initiatives and we characterized them on three different components. I'm going to describe each one of these in a second, but let me give you the overview.

First is their stage of development, how far along they are on the technology path, on the development path. The impact and timing, how important are they, when are they likely to hit. And the gap between what's being done and what would appear to be required to close the research area, to answer the questions that were originally

posed back at the beginning.

Because that's what these are all trying to do is answer questions with sufficient certainty and completeness to be able to allow people to make decisions. Now here is the first of those three that I mentioned, stage of development. To those involved in R&D in transmission distributed energy resources in canned foods, it doesn't really matter, this is a taxonomy that seems applicable across a broad range. We focussed it on transmission, but it runs from the beginning where there is high level or excuse me, there's research at a very high elite level looking at broad needs. Sort of testing concepts, looking for ideas, moving through development and then through demonstration, you'll see several phases of demonstration. Just add a little clarity and specificity.

And then finally commercialization. And this is a taxonomy that we applied. We looked at each one of the projects and we said so where are they relative to this? Is this a pure research project, in which case it would be something interesting, but dealing with things that are sort

of far out, if I can put it that way. Certainly not demonstrable and applicable. Is it a demonstration project moving it closer to market with higher degrees of technical certainty, lower degrees of market and regulatory uncertainty?

Is it in fact a commercialization project, where it's simply taking existing information technologies and applying them to the market? And sometimes what has to be a very significant first test, but nonetheless a commercialization activity. So that's it. And I assume that that would look fairly similar, should look fairly familiar to all of you.

We also then used another criteria, which is the impact and timing framework. And here we tried to determine whether the initiatives underway were base level, that is they were basically essential to today's business and they were the common denominator for performance and trust. That is, pretty much everyone had them or had variations of them. It was a refinement of something that was given and existing in the marketplace today. It would be a base technology that you would find represented.

The second classification was key, which

technologies are important and provide performance and cost advantage to those that are playing in the area? It's a little bit a step above in the sense that it provides advantage in performance or cost, base level doesn't do that.

The next would be pacing. Not yet fully embodied in the current products they're on the horizon, they're about to come into play. And if they're successful, a big if, but if they are in fact successful, they would have a substantial impact on the performance and cost profile in a reasonably near term. This isn't pie in the sky, twenty-years out. This is the next big thing, the important change that's going to happen.

The last area reaches further, almost beyond the horizon to say, these are technologies that have a large impact on performance and cost in the future, but there's a large degree of uncertainty about those technologies. This is exploratory stuff. So we've used those two and took one other criteria to evaluate all of those initiatives.

We asked ourselves on judgement how big a gap is there between what's being done and what is required to close the research gap? A

significant gap is where a few companies or organizations of any type are adequately pursuing this to ensure high probability that they'll be success in resolving the issue.

Remember, going back to that key question. By the way, this doesn't mean that there aren't some people doing lots of things. It just means they aren't doing enough of them. By the way this could indicate, as it says here, that this area has been overlooked or is emerging. It also may just be that it doesn't appear to be something worth pursuing. So large gap doesn't necessarily mean it's the best thing that you should chase right now. It just means that relative to what seems to be required to close the gap, it's not there. It's going to take a lot more work.

Moderate gap I believe is pretty much self explanatory. Continued and additional activity is required to ensure that it has a reasonable chance of success.

And the last one is little or no gap. Those that are playing in the area are doing good work it appears, both in quantity and quality at the level that we're doing the analysis to ensure

the initiative has a reasonable chance of success and then resolve the issue.

And again, the way that we tested this was to go back and say, what's the issue? What's the question? So we started with the question, we went through, we categorized all of the projects into initiatives and into major focus areas and then we said okay now what does that get you?

Well, thank you for your patience, what that gets you -- because we're almost done with the methodology part in case your head is swimming at this point. What that gets you and this is totally illustrative, these are dummy data points up here, because the real ones are numerous and they're about to follow. What that gets you is a layout of each of these initiatives based on the information that we got from the field on their technology development stage. Are they pushing a commercial issue? Are they looking at commercialization, demonstration, development or research? What's their impact timing? Is this a base issue that everyone has or a variation on something everyone has? Is it key, which is something that would yield performance cost advantages? Is it pacing, is it out towards the

horizon, not yet here? But if it does get here it will be important. Or is it in fact emerging? Not sure what it's going to mean, except that if it does hit it's going to be powerful.

So those were the analysis that we performed. I should say that's how we did it. We're about to present the results. And before I go on, I will say the results in the report are laid out so that you can read them and walk through them. There are a lot of data points. There is a lot of data.

I do encourage you to go to that final report. We're going to be presenting an overview here for the purposes of discussion. So if you haven't looked at it, you may need to look at it later over a cup of coffee or a cup of tea to sort of let it soak in and go through.

There is 100 pages of appendix there of data on each of the projects. Many of them are from organizations that you represent. We want to know, did we adequately categorize them, represent them? Is the data all correct? But we won't talk about that so much now, we'll talk about the implications of that.

We wanted to pause for a methodological

moment, I think,

MS. KELLY: Yes. We want to keep on schedule, so if you have questions on this methodology, I'd like to keep them short and to the point. And get a show of hands, how many people have questions? Oh great, okay. Commission Geesman did you have a question?

ASSOCIATE COMMITTEE MEMBER GEESMAN: To what extent did any of the special attributes of PIER enter into your methodology?

MR. SHELTON: At the very end, the particular aspects of PIER started to make a play. We actually, at the very last step chose a couple of projects based on PIER's ability to influence things. We did not exercise that option completely. We wanted input from this group because, what are the special aspects of PIER that should play in? What are the decision criteria? These all begin to have very important effects on the final selection.

So we made a first cut and you'll see some of those. And we did it in order to illicite comments from people, yourself and from everyone here with regards to what are the areas that PIER should play in and alternately, what are the areas

PIER should not play in?

ASSOCIATE COMMITTEE MEMBER GEESMAN: Uh huh.

MR. SHELTON: It was a very good question.

MS. KELLY: Uh huh, yes, please go to the microphone.

MR. WU: My name is Tim Wu. I'm with the Los Angeles Department of Water and Power and I'm the transmission planning manager there. I find this report, it has a lot of information, very comprehensive. I find many of the information there informative and useful. However, we do find some statements in this report that cause of great concerns. And I wanted to bring it to the attention of the Commission as well as the author, that the reason we find this statement objectionable, is that they are factually inaccurate.

Therefore, it is really inappropriate for this statement to be included in the report, furthermore, this statement does not add any value to the quality of this report, nor does it provide any direction on how the CEC should pursue the research.

With this said, I want to direct your attention to page 11 of the report and I will point out to you the statement that we find objectionable.

In fact, one of the statements was quoted during the presentation by Rob. It is attributed to a large regional utility. Since I cannot put a face to that large regional utility, I have to direct my objection to you Rob, and put it squarely on your shoulders.

The quote is that "the voltage stability or instability is a key issue, nine out of the last ten outages are due to voltage instability." So far no problem. And then it went on to say, "Los Angeles is a disaster waiting to happen."

Now I do not know the person who made that quote, whether or not, he is an expert in voltage stability, but I can tell you categorically that this person knows nothing about voltage stability in Los Angeles. That simply isn't there.

And the reason I can say that is not because I work for the Los Angeles Department of Water and Power, but we were one of the first utility, together with others in the west that

developed and promoted voltage stability as an issue back in 1992, '93, and developed methodology on how to study it. And we have studied our system inside out, upside down and we did not find voltage stability problem in our system.

And in addition to those studies, I can also point to you a couple of past disturbance that happened in the west. Many of you probably remember, back in 1996 there were two major system-wide disturbances.

One happened on July 2nd, the other one happened on August 10. And both of those disturbance caused widespread outage in the Western United States and both were attributed to voltage stability problems. But they happened in the Northwest in the Idaho area, not in Los Angeles.

Not only that, the City of Los Angeles was the only major city in the west that stayed on during those disturbances. The lights did not get turned off during those disturbances. So it proved the robustness of our system. That is not just a study, but actual performance. We did not have a blackout during voltage stability problem. So this is the first statement.

The second statement, again, is attributed to this large regional utility. I think we're seeing a pattern there.

(Laughter)

MR. SHELTON: It may not be the same. Don't jump to any conclusions, please.

MR. WU: It says, "The biggest issue in electricity transmission apart --

MR. SHELTON: What page is it? Excuse me, what page?

MR. WU: -- same page.

MR. SHELTON: Thank you. I don't have a copy in front of me, so I'm unsure.

MR. WU: Page 11, same page. " The biggest issue in electricity transmission are power delivery capacity and system reliability." I agree with it. "Much of the power transmission and distribution assets in the State of California are past their service life and are in a dire need of upgrade or replacement." I have a problem with that. Because the visual image that I come up with reading this statement is that I can visualize transmission power crumbling and the conductors about to fall to the ground.

Maybe it's just my active imagination,

but that is the image this statement projects into my mind and I can not really match that image with reality.

And I just want to point out that in 1996 the City of Los Angeles together with other public utilities construction put into service over 200 miles of 500 kV transmission line called Miavillanto (sp) project, that brought the transmission from Southern Nevada to the Southern California area. So we invest in over 200 miles of 500 kV transmission lines. And in 1986, '85 at the time, again with other public utility we have constructed and installed over 700 miles of 500 kV AC and DC transmission lines. And that project is called Intermimon Power Project (sp). And there were a few hundred miles of transmission line of lower voltage, like 230 kV, 345 kV, that sort of thing.

So in the last ten or fifteen years we are personally aware of over 100 miles of transmission line investment being constructed and installed in the State of California.

And in between, also in partnership with IOUs, we actually increased the capacity of the Pacific DC Intertie from 2000 megawatts to 3100

megawatts in 1988. That was a 55 percent increase and maximized the capacity of that very important transmission tie. So a lot of investment was made in the last ten or fifteen years. And even for the transmission line that were older vintage, that were built in the '70s and whatnot, I just don't see them in the same state as this statement is trying to illustrate.

So I strongly to urge you, the author, as well as the Commission to consider deleting theses kind of statements. They are factually inaccurate and they are inflammatory and they do not promote dialog with stakeholder.

MR. SHELTON: Thank you very much for the comments. I certainly am educated as to the history in Southern California. Please understand that those were offered as comments from others. But, and therefore not meant to represent the author. But I understand the passion that you have behind them and the consideration is well understood.

Any other comments. Please come on up. One thing I've learned is that this area called transmission is something that there are a great many passions running around about. And I

continue to learn where those are and try to not step on too many land mines as I am learning. But please, do understand that there really was not meant to be anything that was inflammatory, just meant to be indicative. But as we learn, we go forward and improve. Please.

MR. HOPKINS: Yes, I'm Randy Hopkins with Pacific Gas and Electric Company. And actually I just had a clarifying question. First I'd like to thank you for the large amount of very useful information that's in the report.

But my question really goes to your definition or to your gap analysis. In looking at where the R&D gaps were, it appeared that some of the projects where there is R&D funding going on, may not actually have the utilities here in California may not have uniform or access to that information. Where R&D projects are going forth, but the information may not be transferred to the utilities, was that included into your gap.

MR. SHELTON: That's interesting, no, it wasn't specifically. We were looking at more open transfer situation. If we could find out the information and see that it was ongoing, but assumption, possibly incorrect was that that would

be available. But that's an interesting point, there may be some impediments to technology transfer. So technology transfer in fact, is not only an important element, it could be a role in an R&D portfolio. And that's my take away from what you just said.

MR. HOPKINS: Thank you.

MR. SHELTON: Thank you. Any other methodology? Okay, very good. So here are these preliminary findings and observations, and again, let me stress, these are not the answers, these are not even interim answers. These are what we found, where we are at this point. And we were actually -- the process itself was meant to put us right at this stage of development.

If you look at component optimization and research initiatives, again, in the report you'll find each one of these bubbles detailed with information you can go in and see which initiatives they are. But I just wanted to give you an overview of all four areas.

There are 115 of the 250 projects, they're five initiatives in here. From an R&D management standpoint when I look and when I'm sure that you all as experts in this area look at

this, you say that's a very interesting distribution. There are certainly some activities in base commercial, where things are going on.

And interestingly you see some work in the demonstration area and up into key, and some into pacings. The center of gravity, however, of the current initiatives is sort of in the bottom left-hand quadrant, sort of if I were to do a rough weighting in the key demonstration area.

Notably, there do not appear, based on our assessment to be any projects at the far reaching edge, the upper right-hand corner of emerging research. This tends to look like an area where there has been a lot of focus on things that need to be addressed near the commercialization end and pushing outward.

Again, I would remind you of the comments made around the scenarios this morning, as well as the characterization of this as an industry that lacks historical competition, tends to be risk adverse and conservative. Is mature and tends to do collaborative research.

The second area, capacity additions had 22 of the approximately 250 projects and has three initiatives. And the center of gravity for these

initiatives is clearly towards the bottom left-hand quadrant.

There appear to be moderate to little or no gaps primarily. One of the things that we heard from participants, well, we heard it today as well. It's expensive to do work in this area. Implementation of hardware across major systems, large capacity additions can be very significant with regards to cost. And this would appear to be reflected here.

The next area is advanced systems operations, and again, rest assured we're going to get all of the details in here, this is just an overview. Ninety of the 250 projects or so fall into two initiatives.

This is a place where you see a spread of activities again, notably nothing clearly up in the emerging and the research area. This appears to be an area where we found two particular areas of need. Not only is the technology report that I found interesting here was in the future, we want to move towards an automatic switchable network. And another one, real-time control will be well along in five years. Those are the technology issues.

But there were some behavioral issues as well. We spent a lot of time talking to the operators and ISO folks. If the operators aren't using the technology we're wasting our time. This has to do with an adoption issue, not just a technology issue. A theme that I want to touch on because it came out strongly from our research. And it has to do with the fact that there are, well, there may be important technical improvements that have been made and are likely to be made. There still are some other aspects of this that are important.

The fourth area is the market research initiatives. Twenty-three of the 253 initiatives, this has the most identified gaps. And I mentioned before, it's a bit of a moving target.

There is lots of work going on, if you want to say is there market research? Well there is market research, but remember we were focusing here on issues around modeling and assessment and work that would provide policy and decision makers important information on which to make decisions. Not white papers or theoretical studies, or identifying what needs to be done.

Basically from this it would be

important with the large gaps identified to say that R&D regarding policies and market structure effecting transmission seem to as important as technology R&D. I did, you know, I suddenly realize I'm a little gun shy to read another quote.

(Laughter.)

MR. SHELTON: But why not, right, we've identified that that's a way to get important comments out. And that is our goal. I remember I said it, didn't I, constructive conversation. Alright, well in that spirit, let me read two others.

"Regulators are not" -- I'm pulling this out of the report and I'd have to go -- Well, I'll find it in a second for you. I'm sorry I didn't do that. "Regulators are not putting the incentives needed for transmission to be profitable. The financial markets are not willing to put money into transmission. Right of way for new transmission is next to impossible to obtain." I didn't consider that a particularly uplifting assessment, but nonetheless I thought it was important.

One other one, "We need incentives in

place to encourage investment in transmission." And then, one last one, "Some of the biggest issues involve the new players and the new rules that are creating many more transactions on the grid. New players goals are not necessarily the same as the transmission operator/owner. We need to have some semblance of reasonable behavior for the new players to ensure the grid remains reliable."

Things that seem to be important to those folks that are involved in. Now I promised you that we would get into some of the detail. I do want to present the next few steps. Actually I'm going to ask Peter Mackin to come up so you don't have to listen to me drone on continually.

But I did want to show you that if you lay out all of the identified initiatives that we built from the R&D projects that we identified out there in the field. And put them out there, using the framework, this is what they look like. The numbers represent the numbers and the figures are represented on the tables there and the appendices go into great detail.

But we wanted to give you a quick overview of what happens when you try to sort

these out a little bit. And to Commission Geesman's point, when you wrestle with the issue of how do you make decisions about what the role of PIER should be relative to other bodies that may be involved in making R&D. Did you want to come up here.

Did you want to, or do you want me to take it through the next one, just to say --

MR. MACKIN: Well, I mean the next line is just read the --

MR. SHELTON: -- yes, okay, that's true. Basically the next one -- this slide says we basically remove those with low gaps. If you want to comment on whether those small or low gaps are appropriate, that's entirely reasonable. But the logic is pretty clear. Small gap areas are less attractive for research and development than moderate to large gaps. Not rocket science there, it's not to say that they are insignificant, or that they're not important, but that they're fairly well covered.

MR. MACKIN: Okay, and I'm going to -- I'm Peter Mackin, I'm going to take you through the next few slides. I kind of want to mention I sort of felt a little bit like Rob was Edgar

Bergen and I was Charlie McCarthy, so when I'm talking, don't look at Rob, his lips might move and you might figure out what we're doing here.

(Laughter)

MR. MACKIN: Okay, so as Rob mentioned, we took the low gap research initiatives and removed them from the analysis and what we came up with is what you see here on this slide.

And you can see, it's a fairly well distributed or fairly even distribution. But again, there is no emerging, the emerging research areas is kind of empty as it's been through -- probably because of the way, you know, the historic reasons that Rob mentioned about transmission.

And then what we used, taking those projects, we went and used the criteria, the following criteria to try to come up with high priority initiatives. So these would be -- that's not to say that the other initiatives that we didn't select as high priority, it doesn't necessarily mean they're not something that you would want to invest in.

But what we were looking for were things that were clearly high priority that you really

didn't have to spend a lot of time, you know, analyzing should I spend a lot of money on this? You know, what happens with different scenarios? Is it still going to be a good investment? We basically said these are the ones that regardless of what happens they are probably a place where you want to spend some money.

And so the criteria that we used to select these opportunity were that number one, they met the CEC PIER Funding Criteria, all four of the CEC PIER Funding Criteria. That they were also lower risk. So that if you spend money, your not at risk of just pushing money into a black hole and not getting anything for it.

Also that the opportunities appear to benefit relatively diverse stakeholder groups, so your not just spending money to benefit one set of stakeholders. Opportunities that are considered technical in nature rather than the policy, so we didn't want to have -- we didn't want to spend money -- well we wanted to spend the money on the high priority initiatives on things that were technical rather than policy, because policy sometimes can change, and so there is that issue there.

Also, opportunities that if you were successful, they would create, or have a large impact, so sort of a large bang for the buck kind of situation. And finally, opportunities where the CEC can make a real impact by their participation. So it's a situation where, perhaps, other entities aren't stepping up to the plate and the CEC could make a big impact there.

Okay, and so what we did, we basically identified four opportunities that were high priority. And they are indicated on the slide here in the blue, so we wiped out all the colors that indicated gaps. And just colored the -- everything that's yellow is the other projects, the blue ones are the high priority projects.

And we have two that are in the, go to the next line, we have two that are in the component optimization area. And both of these projects or both of these areas have a medium gap. And they, the first one, number one, is the conditions in place of the worst case conditions, which are the rated conditions to come up with system operating limits.

And you know, some examples of those type of research projects would be, say the

dynamic thermal rating project, where you use the donuts, for example and you put them on the line and you measure the actual conductor temperature and you have actual weather information like wind speed and ambient temperature. And you can use that information to calculate real-time rating and perhaps get a higher rating for the facility.

And another possible project along the same lines would be the fiberoptic temperature, distributed fiberoptic temperature sensors. Where, in this case, instead of -- the first projects was more for the overhead transmission lines, where this project would be more for increasing the capacity of underground transmission. Where you would be able to have temperature sensors all along the conductor under the underground transmission and be able to, in real-time have information on temperature and be able to calculate ratings that way.

The second opportunity is in the component optimization area is the one that's numbered 19. And that is to apply storage technologies to enhance transmission capacities.

And a couple of examples there, I think they were touched on earlier, are things like

doing research into the storage, energy storage like supercapacitors, batteries, fly wheels, things of that nature. And one of the projects that we actually looked at was one where it was basic research into the storage elements themselves and how to enhance their storage capacity.

Another project was to look at the application of that storage technology, the energy storage technology to try to increase the transfer capability of a system. And I think Dave, Dave Hawkins mentioned earlier that the, you know, the western grid in a lot of cases is dynamically transient -- stability limited.

And so if you have this energy storage device and you can place it in a key location and inject the energy into the grid at the proper moment, you can increase the transfer capability of the system, and for not much cost increase transfers.

And there were, actually there were no high priority projects in the capacity addition area. The next two are in the area of system operability. And in markets. For the system operability, what we found was that the one

project that was identified as high priority was to integrate and streamline database and information systems.

And one of the projects that we, as an example was to look into new system control methodologies, where you would perhaps, come up with new methodologies for applying ancillary services like AGC or spinning (sp) reserves or voltage control and by applying those -- that information, you would have, you would be able to create increased transfers on the system. Either increased transfers or you would be able to reduce costs because you would be able to reduce the reserve requirements and reduce the cost to consumers for energy supply.

And another project in the same area that actually, I personally thought was kind of interesting was to look at, it's called a -- it was an ISO project to look at frequency tracking across the U.S.using a web-based system.

And the beauty of that is that the operators would be able to see in real-time, they would have a visual picture of what your interchange control area, error -- area control error was, your ACE, and also the system

frequency.

And by seeing both of those displayed graphically on a display, you would be able to locate areas where you might have problems and be able to take corrective action before the situation had system problems and security violations.

And the fourth high priority project was in the market area. And in the market area, we wanted to try to concentrate on areas that were not policy. We wanted to try to, for the high priority projects steer to projects that were more research based and that would have you know, wouldn't be subject to the -- of policy.

But they are different time frames. One of them is the short-term energy market simulator. And it's been mentioned before that, you know, it's really valuable to be able to test your market designs on the small model rather than the big model. Because you know, a nine billion dollar mistake is kind of a big mistake to make. And it would be nice to test it before you implement it.

And being a transmission planning engineer, I've, you know, I've learned that you

don't go out and -- you always do your plans ahead of time on the computer model so you don't go out and just build a line and connect a dam and do a stage fault test on it without making sure that before you do those tests that's it's really going to be -- you're not going to tear the system apart.

And then the second project, related to this in the same area is the, it's the long-term power market simulator. And there, this simulator takes the information that you use in the short-term markets, but also expands it to taking into account things like load growth and demand response, interest rates, rate of return requirements and fuel pricing. And helps -- would give you a feel for different market designs, you know, what the impacts would be on the long-term basis.

So that's pretty much the summary of the findings. We didn't want to go into any detail on some of the other projects, they're all documented in the report. And you know, you can look at it at your leisure. Someone mentioned earlier that you might need to look it over with a cup of coffee or a cup of tea. I think your going to

need a big pot.

(Laughter)

MR. MACKIN: It's a pretty big report.

MR. SHELTON: Don't go away, let me just -- before we go to the discussion, which is what we're aiming at -- thank you very much for doing that and don't go away because we're going to answer questions.

We have attempted to apply some criteria to select some high level first cut initiative possibilities. The purpose for doing that is to exemplify that you can do it, but also to show that the criteria used will strongly influence what the outcome will be. So, one of the things that we would like to have in this constructive conversation, I personally would like to hear, because I'm hungry for information that will help make us better able to finalize the report.

It's what you think important criteria are and as we've got a bunch of questions that we want to walk through and if I can, I'll show those to you. And we can have a constructive, sort of dialog around them. We did lay out these questions.

I think that at least we ought to agree

that we've got a partial answer to all of them. The first is, what do you see as the key issues, challenges facing the transmission sector. I'm going to throw out the next one too, opportunities to be low risk and opportunities that appear to offer benefits to a relatively diverse -- I'm sorry, what have I got here. I'm reading the wrong page in front of me.

Okay, I'll try again. What do you see as the key issues/challenges facing the transmission sector? Do you believe that these challenges can best be addressed by technology, regulation or a combination of both? And what perceived and real risks are effecting transmission R&D investment? What can be done to reduce those risks?

Can we stop there for a second and see if there is any discussion and sort of stage our comments that way? This is a natural segue from some of the scenario work that's done. But I want to see if there are any further thoughts relative to the presentation just made.

MR. WU: Tim Wu, Los Angeles Department of Water and Power. I'll try to be less passionate this time.

(Laughter)

MR. WU: I want to address your second bullet there, where the question that's posed is, do you believe that this challenge can be best addressed by technology, regulation or a combination of both? And my opinion is that definitely combination of both. The reason I said that is that I want to make an observation that in a lot of the technology that you identified or research initiatives that you identified as well as this morning, that the topic of research.

Many of this research were actually initiated and nurtured during the time when the utility industry was regulated. A lot of the research that you site here were done by EPRI and we need to remember that EPRI was formed back in the 1970's by the utilities. When we had integrated utility and the environment was stable, we were able to fund significant research projects. And all of these items that, especially in the components improvements and study methodology, all this research, substantial advances were made during that time period.

After de-regulation, everything stopped, even before de-regulation when the environment was

uncertain, everything stopped. So if you want to see significant improvement in advances in the research, it definitely requires (a) strong leadership in the regulatory environments, (b), the political leaders or the Commission such as CEC.

So I definitely believe that this challenge, that I would say that it can only be addressed by a combination of technology and regulation.

MR. SHELTON: Thank you. I'm not sure you were less passionate.

(Laughter)

MR. SHELTON: But I certainly understand exactly what you're trying to say. And there wasn't a question in there, I think that's a comment and we'll take that and it's duly noted. Any other?

MR. EVANS: Yes, I'm Peter Evans; New Power Technologies. I think you did a great job on this by the way. I actually, I'll respond to a couple of things and then I won't come up and use peoples time again.

First is an overarching comment. These all go to your page nine, by the way, in the

overheads. My copies black box where the question is posed in terms of research opportunities that can enhance transmission reliability and capability in California. And my first point is, that transmission isn't an end in itself, it's a means to an end. And while I think it's appropriate to narrow the scope of a research plan, I think as you go through and screen, and identify research gaps, in my mind it's really power delivery reliability and capability in California, of which transmission is one way to achieve that.

And some transmission solutions might be eclipsed in terms of their priority by non-transmission solutions, or non-wire solutions. That is not to say that that falls within the scope of this R&D, but as you assign priorities it's appropriate.

The second thing, which I think is a direct answer to your question here. The biggest issue by far facing transmission is that there is no financial incentive, no direct financial incentive for transmission stakeholder to enhance reliability or enhance capability. And I'm not sure that the solution to that problem falls again

within the scope of this R&D exercise, but how it gets solved, or if it gets solved has a dramatic impact on the value of what comes out of this and what types of things will make sense.

And then the last point is that you've, I think, given it the college try to dig very deeply into what's out there and what's not out there and so forth. And I think the one caution I would offer, is given particularly that there is not a lot of emerging research type of activity, that by the time you get through such a comprehensive analysis it may appear prescriptive.

And so hopefully, when the plan is implemented there will be lots of latitude ideas that didn't fall into the boxes that you identified here, but still go to the overarching objectives of the R&D Plan. Maybe things that you didn't even encounter, in fact likely there will be because most of the stuff that's in here is stuff that's near term, close to commercialization, you identified -- you made that point yourself.

Most of the things that you looked at that are going on now are near term, close to commercialization, pretty much within the standard

way of dealing with things. And there may well likely are things that are well outside conventional wisdom, but that go along way towards achieving these objectives.

MR. HAWKINS: Dave Hawkins, CA ISO. First of all, let me make a general comment. I was a little disappointed we didn't have any items in the upper right hand quadrant of your matrix that was, you know, way out technology, still emerging sort of things.

I guess I would lobby a little bit that maybe superconductivity cables might fall into that category, even though there is a demonstration project in Detroit, it certainly has not achieved success. And it certainly hasn't rolled out much more than that. So there is a lot of work to be done there.

The other area that is really, I think, still way out technology is the fact that we are now getting 30 scans a second type data transfers to us, which is a lot different than the old 4-second scan rate for EMS computer systems. We have no idea how to control the system getting 30 scans a second, nor do we know how to go fix everything and so forth. So I think that we

really would push the boundaries of current knowledge as we get into those particular areas.

But, that aside, let me come back to addressing your three questions. First, and the last speaker I think was right on target. We have a major financial issue in facing the transmission sector. What is the right rate or return? How to incent investments in this area?

We had a Workshop here, a month or so ago, on how to fix the rate of return issues. If the -- on the other hand, the rate of returns are set so attractively, say 13.5, 14.5 percent that then the transmission owners are incented to push the dickens out of there existing equipment, especially their transformers, our fear is that, you know, we will instrument these things like everything.

So we will actually take life out of the existing transmission system that is in the system now that we're really kind of counting on. So we would be cautious, both on how far we would go to instrument all these things.

Second issue, I saw is in the right of way utilization. That's one of the major issues and a lot of the technology projects go to --

reconductor. Can I up the voltage? How can I do anything to utilize existing right of way more effectively than I currently am using?

Again, if you start thinking about technologies that we sort of ignore around here, we were pushing EPRI a year or two ago that, gee, there's a lot of new materials that are out today, we see very little research work going on in under-grounding of cables, or under-grounding transmission.

And maybe that's a big issue back East and maybe their going to fund it all for us. But certainly as we see location and placement of new transmission in California as a tough issue, under-grounding is still going to be, I think someplace in our future that we need to look at.

And of course we probably talked about another big issue is how to take the existing transmission and push it close to stability limits. That's one of our key areas.

In terms of the -- question and challenges addressed both by technology and regulation, obviously we think regulation and financial, all of those have to be combined.

And on perceived risks. I really did

not want to let this one just go by, because certainly this is an area for anybody who builds transmission. And you've had the ABC salesman show up in your doorstep. And it says, hey I've got the greatest brand new conductor or the greatest new insulator or whatever. And some transmission planner says, great, I'll build this 500 kV line for this thing. And you put it up and low and behold it falls down within three years. That's a career limiting experience.

(Laughter)

MR. HAWKINS: So most transmission people today are really looking for how do I actually field test some of this new technology and lower my risk before I go build a 50-mile line or 20-mile line with this. And so therefore the return or the timeframes on doing some of this R&D investment on new components has to be field tested. And that sometimes takes two or three years before your finally ready to push it around to commercialization.

So as you think about how to do the risk mitigation in this area, sometimes there is just no way to shorten some of the timeframes that some of this stuff rolls out. Thank you.

MR. MACKIN: Dave, I'd just like to make one comment. You said that might be a career limiting experience. Probably not for the transmission planning engineer, but probably for the transmission line designer.

MR. SHELTON: Those were excellent comments and rather than respond to all of them, let me just say duly noted and valuable input.

One interesting thing about superconductors you mentioned as a far out technology, I would have classified them that was as well before we started this, but in talking to many of the people doing the work in this area, they say that the major issues around the materials are actually pretty well addressed.

The issues that are bugging them right now have to do with the connection, the rather mundane stuff of hooking it up with the other existing material systems et cetera. That's what's bothering them, that's what's holding implementation and execution up and that's not high tech, and that's not in the emerging upper right-hand corner.

So just to let you know, sometimes in this R&D area, what you think is tough and far out

isn't really the case. That's one reason we based all of this on what we heard in the field. Can we go on to the next set of questions, unless there is anyone, I'm sorry, I obviously haven't had enough coffee, or I've had too much coffee, I'm not sure which. Please, please go ahead.

MR. TORRE: Let's see, My name is Bill Torre. I'm from San Diego Gas and Electric Company. And I did have some responses on your cursory questions.

MR. SHELTON: Please.

MR. TORRE: First is regarding which key issues facing transmission sector. The key issue I see in the transmission area is increasing capacity, transmission capacity of existing transmission lines while minimizing the impacts to the environment and local communities. I think that's a challenge.

In today's world in the utility business and siting transmission lines and licensing transmission lines the challenge is to meet the capacity requirements while minimizing the impact on the environment and the local communities.

And it's a tough thing to do. And I think R&D that can be done in that area would be -

- have a better payback, not only for the customers buying power, but also communities that live near power lines.

Second question is what perceived real risks are effecting the transmission R&D development? I say the biggest risk is not doing anything and letting the transmission constraints continue to get worse. And right now we do have serious transmission constraints in California that limit power transfers.

I said the best way to minimize R&D risk is to invest in those activities which have practical and high potential for improving transmission capacity and efficiency.

And then, regarding your third question, what technology tools and analysis hold the greatest promise for meeting current and future challenges in transmission? I wanted to mention that, and I think this is reflecting earlier statements, that increased high temperature operation of overhead conductors, real-time line ratings, increase structural capacity of existing poles and towers.

Basically just being able to increase the capacity of the existing transmission lines

that are out there, I think would be a great step in the right direction. Building new transmission lines is very difficult, very costly. There are some things that we can do to the existing lines, improvement to increase capacity and meet our needs. if we do it -- use our smarts and spend our money wisely. So that's my suggestion.

MR. AHMED: Syed Ahmed from Southern California Edison Company. I just wanted to make a comment about the high temperature superconducting technology. Southern California Edison had been participating in high temperature superconducting projects since 1993.

And it was mentioned regarding the Detroit Edison project, basically Detroit Edison project from -- substation to downtown Detroit, the high temperature superconducting material, or cable did not fail, it was the cooling, because there were 90 degree bends into it.

And that underground channel was build somewhere in 1905. And the conductor was pushed through that. There were very few drawings available, but the thing which was not noted that there sharp bends. So high temperature superconducting transmission cable had been

operating very successfully in Carrollton, Georgia on the Southwire facility. Basically they had three lines going, feeding the three manufacturing plants. And as a demonstration project, one high temperature superconducting cable replaced the three feeders to the entire manufacturing plants of Southwire.

Also, there is a brand new project in downtown Albany, where this time, we have looked at there shouldn't be any sharp bends. So hopefully, this will be successful. Thank you.

MR. SHELTON: Thank you very much.

MR. O'CONNOR: Good afternoon. I'm impressed by how thorough and comprehensive this is in the amount of time it must have taken you to go through all the projects and categorize them in so many ways and so many dimensions, you ought to be complimented for that.

Again, name is Tom O'Connor. And I'm going to go over those bullets very quickly. Discussion topics, key issues challenging transmission sector. Make it relevant to what's happening in the market. You know, this is an integrated process.

What's happening in the generation

market in terms of utility procurement now that they're getting back in the business of buying power. And also, particularly with the respect of buying renewable power. To make sure that the, you know, the system ought to be vital and vibrant to helping procure power, get it on grid to we don't have any more blackouts. And just as a divergent, I live in the City of Los Angeles. I remember very vividly the blackout in August, and we did lose power. It was just a half hour, maybe not as bad as the other --

MR. SHELTON: I've actually declared a moratorium on all further conversations. Every time someone comes up from Los Angeles I flinch.

(Laughter)

MR. SHELTON: I'd just as soon keep us moving, okay.

MR. O'CONNOR: But, L.A. did a very good job of getting back on power is my point. And also remember where I was with the blackout of 1965.

MR. SHELTON: No, no, no, no.

(Laughter)

MR. O'CONNOR: And challenges in terms of being addressed by technology regulation. I

think it's a combination of both. You can't have, you can't do it in silo's. You can't do technology here and regulation here, they have to compliment each other.

And what's perceived as real risk effecting transmission? I think we need to develop on a collaborative basis the skill set necessary to address these challenges starting with basic research and going through the dimensions you mentioned.

And that get's to another point. I don't see here the, and maybe it's implied, maybe it's implicit. The role of collaboration, leveraging and cost sharing. Because in terms of -- if you take a look at the role that maybe some university's done in terms of basic research or emerging technology and is not captured here, maybe that helps full the gaps that you've identified.

MR. SHELTON: Those are good comments. Let me respond to the last one quickly because I'm sensitive of time. Actually we did comment that consortiums and collaborations are the standard way of doing things. And if you drill down and look at the projects that we have in the 100 pages

in the appendix, you'll find many of them, I could say most are collaborative and consortium based.

We are looking in the future at collaboration and consortiums for cost sharing, risk sharing and the like. So point well taken. We think that that's built into this going forward. And I took it that was an endorsement, not just a statement that you expected to see. You think that that's a good thing to do or am I --

MR. O'CONNOR: In collaboration, absolutely.

MR. SHELTON: Okay, that's good. Thank you, thank you very much. I'm going to take us to the next set of questions, as long as everyone is comfortable. These build upon what we've done, what we've spoken of so far.

What initiatives hold the greatest promise for meeting current and future transmission? I think we've actually covered that. This now leads us to unpacking I think some of the most important or issues.

What strengths can CEC apply to meeting these challenges? Where should CEC focus? Which initiatives are most attractive from their

perspective? I realize you all come with your own perspective, but now I'm challenging you to think outside of your box and in theirs.

What areas of transmission R&D should CEC avoid working in? So let's go to this next round. And if you've made your point, you don't need to make it again, even though some of these questions may have brought it up. I think we've registered that we really would like to focus on these new issues.

MR. LORDAN: Rich Lordan, EPRI. One area I would encourage you to look, we talked about the right-hand quadrant, Dave did and I agree that it's a shame that we can't fund that kind of research. But you might want to look at some other industries for emerging technologies, fullerines, nanotechnologies, advanced materials. And maybe we can piggyback off of their advancements, so that's an area to look at.

Also, I'll take this one off-line, but you came up with a different level of priority for some of the hardware technologies as compared to this morning's discussion and maybe you can add some insights as to how you arrived at a different conclusion? Do you want to do that now?

MR. SHELTON: I can try it in the short version. One, some of the hardware that was mentioned before and Joe actually referenced this, falls into capacity addition, not just component optimization. So, while it was called hardware, you might not think of it as -- capacity addition, you notice didn't -- there are opportunities there, but it necessarily get a vote for one of the clear high priorities right now, while component optimization did.

The other is that we did not feel based on what we heard in the R&D environment that component optimization was necessarily an area of low return or low interest. It's an honest difference of opinion. We'd have to actually -- we need to as a next step unpack some of the assumptions and go in and see what caused that. I don't have an answer to the details that caused it.

But it strikes me that, as I said, in the first part it's semantic. We need to get that straight. In the second, there is just, I think some different assumptions about what would be a high yield return. If you assume for instance that hardware is, it's a no brainer,

everyone's done it. Then I agree, you wouldn't invest in it. Our data indicates that there is still a lot of work and need for activity there. At least as far as the people playing in the arena say, again, we're representing the bottom up.

Did that sufficiently address your question?

MR. LORDAN: Thank you and at least from EPRI's perspective, we do a similar thing to what you and Joe have done. And then we go to the utilities and look for funding. And with the areas of hardware, it's hard to attract excitement in that area. If we have work in asset management and things that will make the equipment last longer, there's all sorts of energy for that. But the drive for equipment is not there. It's not something that's going to happen naturally with the manufacturers.

MR. SHELTON: Well, again, caution, some of the stuff that we're talking about is -- has to do with improving components.

MR. LORDAN: I understand.

MR. SHELTON: And that's, and that's not just straightforward boring hardware stuff. I mean, we also heard some people saying that there

is real value to be gained in being able to change the conductors capacity and various things like that.

MR. LORDAN: And my last question or I guess my comment it, the issue of categorizing the projects into these focused areas. I worry that we might have missed an opportunity in the integration. Looking across the areas and for open systems architecture for example, that will allow the equipment to work with the software and the legacy databases and I think that the seams issues is where we're going to get a lot of benefit in some of the areas.

And I think that's an area that California can play a big role, making everything work together so that new players can come in and develop systems that can work with other systems. And in that regard, I think the seams issues with operating reasons is the other area that I think we should work on. And I'm not going to speak to that because Steve Lee is here and he is our brains behind that. So maybe before the end of the day he'll talk about seams issues as it relates to interoperability. So that was my comment, thank you.

MR. SHELTON: Thank you.

MR. LEE: Let me follow-up. My name is Steve Lee from EPRI.

MR. SHELTON: Are you going to be presenting?

(Laughter)

MR. LEE: No, no, no. It's very short. I would like to bring up a research need that cross-links two focus areas, namely advanced system operations and markets. This need deals with the seams problems between regional transmission organization and ISOs that collectively operate within the Western Interconnection. It addresses both congestion management and FERC's vision to achieve a global market for the west.

The goal of this research would be to come up with an objective and sound system of coordination among the individual ISOs or RTOs within the West that would ensure both reliability and market efficiency while overcoming barriers due to regional interest.

This concept is called a virtual RTO, it is not a single legal entity, rather it is a group of well coordinated transmission grid operators.

Research is needed to study the coordination methods through computer automation and set of clues. So that individual ISO or RTO can operate under its own market rules and yet achieve the benefits of a single RTO.

This will coordinate congestion management in real-time and engage in economic interchanges among the markets so that maximum market efficiency can be achieved. A method is also needed to give all consumers in all of these markets lower electricity prices. This concept has received attention among economists, NERC and FERC. It will enable different market designs to coexist within an interconnection.

It would suggest no regrets technology investment and research efforts to lay the foundation for a flexible future regardless of which scenario would unfold and how the industry would choose between markets or more regulation. EPRI will be happy to provide written comments on this subject, thank you.

MR. SHELTON: Thank you.

MR. CORLETT: Do you have other questions beyond this or is this the west?

MR. SHELTON: This was it.

MR. CORLETT: That's it?

(Laughter)

MR. CORLETT: Jim Corlett with San Diego Gas and Electric. I wanted to mention that within two of your focus area, the component optimization and the advance system operations, we like the specific technologies targets you found in there. We think that they're great.

All we want to do is kind of let you know what we think in terms of priorities of the focus areas themselves. And we would say that as far as the number one priority from our standpoint in the electricity utility business in the capacity additions focus group, or focus are, I should say. Then comes component optimization, then advance system operation and last, but not least, markets.

That's the kind of way we see that we ought to be paying attention to the focus groups themselves, but within those areas, we think you have some great technical ideas, thank you.

MR. AHMED: Syed Ahmed from Southern California Edison Company. Basically, I commend the work done by the Navigant document. In this one, the basic criteria of California Energy

Company because there is a time horizon for five years. And also there is a certain limit of budgetary constraints.

What we feel, at Southern California Edison that the transmission hardware, the competent level should be from 2nd priority if it is given at the higher priority, that will improve the system much better. The reason being is that, yes, if we have real-time grid and asset monitoring and analysis tools, yes it does increase the efficiency.

If there is transmission power-flow control, which we already have, but if we improve it further by using the existing computing powers, yes it will increase the efficiency, but the percentage of increase is comparatively small. Because a lot of work is already being done and already we have very powerful computers and PTI Software and the other softwares, a bunch of them. And also a lot of work at the University level has been done in this area.

But the neglected area for the past 20 plus years had been the transmission hardware, the conductors, the insulators, the transformers, the circuit breakers, and talking about high

temperature superconducting, Southern California Edison realized that this technology will be coming.

Now, as far as the conductor, technology is there, but as you mentioned the application, the real-time application, if we have a small portion of a transmission line which can carry 300 percent or 400 percent or 500 percent power, but still it needs to interface with the existing circuit breaker, existing conductor, which will be limiting the performance of that particular segment.

So the emphasis on research, if it is on transmission hardware, plus the other area, that will make it much more effective. Thanks.

MR. SHELTON: Thank you. While your coming up, please do, I will comment just a little. Those were good comments. I just wanted to say, the, maybe advanced systems operation work is well covered as you say, and you know, our data is there and a difference of opinion. I think that that's one of those places where we can compare and contrast.

I will point out, however, that there is, as I said before the technology side and the

use side. Getting people comfortable with advanced systems, particularly when they change the risk profile, career limiting moves and the like, is an important aspect of getting the technologies utilized and effective. Simply having them on the shelf obviously is not sufficient.

So I am pointing out that at least from our work, there were those two components and you need to differentiate the technology per say from the implementation and use side of things. As everyone in IT knows, the technologies can do many things. But if people don't know how to use it it can actually be perverse and cause the wrong results. I just want to say, those are still two areas that deserve some attention based on our work. Please.

MS. MCCORMACK: I'm Katie McCormack with the Center for Resource Solutions. And we are managing a Renewable Research Program with CEC funding on behalf of a coalition of public power entities.

And I just wanted to mention in the context of the discussion about renewable resources and transmission capacity this morning,

that one of our key research efforts under that program is to evaluate various transmission options that would bring California and neighboring State renewable resources into the California grid.

That project us underway now and although we're not looking at too many advanced transmission options, we certainly hope that we will be turning up some of what seem to be the key gaps on your gaps assessments for meeting that specific need. I just want to make people aware of that project.

MR. SHELTON: Thank you. We have just a few minutes. I'd like to ask a question if I might, because I haven't heard a response to this, or maybe I haven't picked up on it if it's been there. I've heard recommendations of areas that should be addressed. And there have been different opinions on that.

What about areas that CEC should not address? Think about it a second. This is going to be a bad note to end on if you just sit there. I'm willing to do that, but I've heard strong opinions. Maybe you should think a little bit and at least stick your neck out a little bit and give

some thoughts. Please, Dave Hawkins.

MR. HAWKINS: Dave Hawkins. Let me take a wild shot at this. One of the things that's been put into the transmission grids over the last several years, is what are called RAS schemes, they're remedial actions schemes. And so the complexity of how all of these things interact with each other is really kind of a challenging area.

It would seem though that that is an area of expertise for the transmission owners themselves. I think that they've done a lot of work in that area. I think that they should really be on the hook for studying what are the interactions of all of those. And I don't see a real role for the CEC and necessarily go trying to build complex models for studying the interaction of RAS schemes, does that help?

MR. SHELTON: Thank you. So we have only one area that you would feel the CEC should not go into. Well, on that note, we'll end out presentation. We do look for comments, both detailed description of projects, changes and any of that information in our database. As well as general comments.

If you didn't get a chance to make them today, if you think of something later or you find that that's a better format to use, please do send us the information via e-mail and we'll use this.

And again to recap the process, we take this and now we can now go and begin to fine tune, finalize the report and use this The patient was born and raised in , came to California in provide input outpatient the CEC PIER, who then take it and move it forward into investments decisions. So thank you very much.

(Applause)

MS. KELLY: Thank you Rob. What I'd like to do is give everybody five minutes to just stand-up and stretch. We're a little bit ahead of schedule. But I think you might have telephone calls to check, or whatever. But at quarter till, let's get back here and we'll finish up with implementation.

(Thereupon a recess was taken.)

MS. KELLY: Okay, so, for most of the day today we've talked about developing a transmission plan. We've talked about the scenario analysis, the research assessment, those tools that we are going to use to develop a

transmission plan. And I'm sure everybody is interested in that.

But then the next step I'm sure everybody is interested in as well. Once we have a transmission plan, what are we going to do? How are we going to implement that research? Are we going to do it in a timely manner? Is it possible for a government agency to do anything in a timely manner?

I think these are all questions that we've asked ourselves. We realize the importance of this research and what we also realize is the importance to get it done quickly. To get it focused and to do it efficiently. So when we began thinking about the transmission plan, what we also began thinking about is how would we implement this plan?

And this proposal that I'm going to talk to you about today is just a proposal. We've thought about it. We've put together a structure and we've developed some roles for the various members of that structure. So I'd like to just present it and share it with you today.

In some cases, you may ask us questions about this that we haven't even thought of, but

that's part of why we wanted to share today, is to see what you think about it? What inputs you could give us on how we could improve it? What questions we should ask ourselves? And again, even with the roles, you know, whether we've adequately captured those roles?

So, the first thing we thought of and this is really, actually has been a high priority with staff when focusing not only on the implementation, but on the transmission plan and all PIER activities. What are the key criteria that should drive all our activities?

And so the first thing is, is that we want to make sure that the highest public interest transmission issues determine the research. We want to support State Transmission Policies, this is a logical step. And we want to accommodate strategic relationships.

The mention about collaboration by Mr. O'Connor is something that we have been just hammering away at for everybody. We all have limited funds.

All right, additional considerations, if we develop and implementation strategy, what would be really important, what should that strategy,

what considerations should be incorporated? Well, as I said, collaboration is key. It should allow maximum collaboration and leveraging of money. It should also be a transparent process. We want everybody to be aware of what's going on and how business is being conducted.

We also want to make sure that we have the best technical review built into the process. We want to have not only the best research, but the best technical review to make sure the research stays on track.

We also want to incorporate essential portfolio projects from our previous work. We have some successes, as Laurie has said, we've done some transmission work. We want to build on that work wherever possible.

Sustainable and can handle multiple individual projects. We want this structure to go on for a long period of time. We want it not to just -- to have a structure where it's in existence -- for the term of the research, which may be short-term. We want it to be available and functioning for a long period of time.

Also, we want the structure to be flexible. We intend to do a lot of research

within this structure. And so that we want to make sure if there needs to be midstream adjustments, that's aloud. We want the people that are part of this structure to be able to work with each other and do whatever it is to make this structure efficient and work to achieve our objectives.

Also, we want to make sure that we put in place evaluations that will be independent and will give to the Energy Commission clear direction on what is important, where the industry is going and give us checks to make sure that we're in the right area.

Path to market, I think this is something that anybody involved in the research area has to really consider. We want to make sure that the research we're doing has got a clear path to market and we're working with the people that would provide that path to market.

A team approach is desirable and can be accommodated. We want to make sure that we can build teams. Some of the parts of this particular structure, the Program Administrator as an example, one entity might not be able to provide the services we need. But we want to give people

an opportunity and we want to encourage people to talk to each other and potentially put together a team.

If you would think that you would be interested in being a Program Administrator, but there would be one area that you couldn't cover, then we would encourage you to talk with your colleges and talk with others and form teams. We want a team approach to this to be, you know, key and essential.

And then finally, builds intellectual and technical capital in the public domain. We want this information from this research to remain in the public. We want it to be available to the public and we see it being available to public through the Energy Commission.

Now, the structure. This is the structure that we've envisioned for our implementation proposal. What I'll do after -- you can just look at it and I think what I'll do is come back to it. It's somewhat complicated. But I think it's basically, we have the CEC on the top because we're going to do a transmission plan and we're going to determine what the issues are. The issues are going to drive the research.

This is something that we think is extremely important and extremely important that we focus this research. In the past we've done a lot of research, but as we go into the future, as Laurie indicated we're going to focus our research on the key public issues.

You see that then issues, so in the middle issues go to the PAC. The PAC will advise on issues. Issues goes to the program administrator. Issues, you know, relate to the program administrator. The issue will be conveyed to the program administrator and the program administrator then through a solicitation, sole source or some mechanism that will be determined. We'll then contract for the research.

Now we have, just as an example put focus areas there. That just coincides with the four focus areas that were identified by Rob Shelton in the research assessment. We might not have research in all of those focus areas, but just for this example we put them there.

So we have focus area leads. These are people that would be primarily responsible directing the research in those focus area. And then below them are the TAC and the TAC would be

responsible for a whole range of technical evaluations.

I'm going to go into the exact roles of these, but I thought I would give you an overview and I'll come back to this.

Okay, role of the CEC. We see the CEC as selecting the program administrator, managing the funding, selecting the California issues through the resource plan, selecting the PAC, approving project selection criteria, that would be the program administrator would do a solicitation, but we would approve the project selection criteria. We would approve focus area leads and we would approve the research projects.

The Policy Advisory Committee, this is a key component of this research, rather of this structure. The PACs objective is to provide a guidance to PIER ESI that will make it's transmission program a success. And success here is defined as focused, cohesive, effective program that is aligned with PIERs programmatic goals and ultimately provides benefits to California electricity ratepayers.

We see the role of the PAC as providing strategic guidance and giving us critical review

of what our research priorities are, so that we can adjust them in this very uncertain world that we all have agreed exists today.

Input on California transmission issues. We know that the key stakeholders are important to this input, so we see the PAC and members of the PAC giving us input on what are the key transmission issues. We'll identify some of them upfront, but as time goes on, we expect things to change and we want to be aware of those changes as they occur.

Evaluate tangible benefits to California and provide recommendations to enhance those benefits. We want to make sure that the research that we're doing is providing benefits to the people of California and we want to understand how it's doing it and how successful that research is at achieving those benefits.

Identify opportunities to leverage funding from other sources. Clearly in every area that we're working in, we have to use collaboration to leverage funds. There is a shortage of funds and a lot of work to do.

Provide recommendations regarding information dissemination, market pathway, end or

commercialization strategies relevant to research products. So the PAC is going to be essential to helping us keep on track and to achieve our objectives.

The program administrator. The program administrator is going to have a role of issuing solicitations as I indicated, executing contracts for the research, managing up to four focus areas, as I said, we might have less, I don't think we'll have more. Select focus area leads. Will be in charge of selecting who that focus area leads are, what organization, what entity has the research expertise and can direct the research in that focus area?

The Program Administrator will also conduct independent reviews. Now I just, just let me caution you, this, you know, a lot of this type of excruciating detail, if your thinking of all these roles would come in a work plan or a work statement. But we wanted to give just a general overview of what we think are the key roles. There may be more, but these are what we see as the essential and key roles.

Okay, the focus area leads. This is down, you know, in the focus area where the

research will be conducted. We see the focus area leads as managing the research portfolio, managing the tax below them, assuring a path to market, facilitating collaboration between research implementors, issuing solicitations if necessary, sometimes there is additional work that will have to be done.

And there is a potential that we might have to issue some small solicitations and we want them to be able to do that if it's required.

Conduct critical project reviews. Report problems that may effect the projects technical or financial viability to program administrator for resolution. So the focus area lead is down there in the research area, has to have a path to market, I think is critical.

Now we're down to the lower levels. This is what the TAC would do. Review and provide comments for project deliverables, comment and provide guidance on scope of research, methodologies, timing, coordination with other research, results evaluation, et cetera.

Also, they should evaluate the tangible benefits to California and provide recommendations as needed. So that's the roles of the various, I

guess you call components of this implementation structure.

What we did, just like we had done with the other presentations, we put together just a few questions that we thought we would just ask you.

The first question, will the structure best meet the key criteria and considerations we have established? What do you think about this structure? You know, we'd like to get your input on the structure. And even if it isn't today, if you have ideas about this, please, you know, feel free to send them in comments.

Are the roles and responsibilities of the CEC, PAC, Program Administrator, Focus Area Leads and TAC clear? Again, as I said, this isn't a work statement, but have we generally covered what their roles should be? Is there anything that we missed here?

What critical skills and knowledge should the Program Administrator have? Clearly the Program Administrator is a key component of this implementation structure. We are looking to this entity to have a lot of skills that enable it to do administrative work, to do solicitations, to

oversee a basic program.

So this entity will have to have a whole range of skills. We'd like to know if you think that we have captured what would be needed?

What critical skills and knowledge should the focus area leads have. The Program Administrators is up there on the top, helping direct the program, down in the focus area, we want to have the people that are going to be able to do the research and provide good direction and get the research done. And get the research moving during this process.

And so, those are the questions we've thought about. This is the implementation structure that we are considering. As I said, this isn't final and we thought that since we were having a Public Workshop and this is an issue that interests people that we would look to you to get some input and get your comments.

And I'd like to, Laurie ten-Hope and Jamie Patterson will also be helping answer these questions. Any questions? Anybody like to comment on the implementation structure. Mr. O'Connor?

MR. O'CONNOR: Good afternoon, Tom

O'Connor, representing Sempra. One of the overarching goals of this proposal ought to be to ensure that the funding pays for the work so that unduly financed or has a lot of money tied up in administration.

So that there ought to be a process set up where it's simple, it's concise and it flows from program development to actual deployment.

And with that in mind, I'm just curious, and maybe I missed it when I was out of the room, so I apologize if you have to repeat this. How did you end up having four focus areas? Is that because of the analysis done by the two groups?

MS. KELLY: That's there for illustrative purposes. We have four focus areas in our research assessment. If we were to determine in our research plan that we would do research in those areas, that might be a way that we would organize below the Program Administrator.

MR. O'CONNOR: One option may be for consideration, as you look at all options in terms of administration, is maybe to have multiple focus areas and make sure you have a skill set that somebody or a group has the rest of the skill set to manage more than one focus area. I mean you

may be able to just have two, depending on the type of analysis you show, based on the work to date.

Such as technology development and deployment, versus markets. You know, you may prioritize that it's a necessity to accelerate the deployment and demonstration and commercialization products and systems that will enhance the grid.

And maybe there is just a skill set out there that can handle that within one focus area as opposed to two or three. So I will just put that on the table for consideration, not a proposal, but just another way of looking at it.

MS. TEN-HOPE: Can I ask a clarifying question?

MR. O'CONNOR: Sure.

MS. TEN-HOPE: I didn't quite understand. So you would be looking at some functions might go across all focus areas, and so they would be done in common like the path to market and deployment, or did I misunderstand your comment?

MR. O'CONNOR: No, I think that's a -- you know, I was getting to that way, but you probably articulate far better than I did. But

I'm just trying to look at ways, trying to narrow the reach of the administration and make sure the dollars flow to deployment.

Having four focus areas may be the best way of further reflection. Or you may just need two. That's the point I was trying to get to. Depending on what kind of road map you want to set up to enact and get the benefits to ratepayers and customers. Thank you.

MS. KELLY: Thank you. Are there any other questions.

MR. MINNICUCCI: Hi, John Minnicucci, Southern California Edison. I'm really excited about what your saying. The goals of the program and what you want to do, the collaborative efforts and I'd like to add that, you know open discussion is valuable in this industry. And when you look at the markets and when you look at the research funding that's out there, I think that the only the collaborative efforts of all of the people in this room will be successful.

In looking at this, and I agree with just about everything I've seen. It's a lot to process in just a few minutes sitting here. But are you saying that there would be a Program

Administrator and then under that administrator you'd have like another level of administration? Like, you'd have a lead, one company would handle all component optimization, or one company would handle -- is that what your saying by the focus area, lead one and two?

MS. TEN-HOPE: It was kind of envisioned that the Focus Area Leads would be like a portfolio manager of the research, so they'd be closer to the research, projects, the connection between research projects. You might have 20, 30, 40 projects that have links to each other.

MR. MINNICUCCI: Okay.

MS. TEN-HOPE: How, you know, are the right people talking to the right people? And how the research might be staged. Whereas, the Program Administrator would handle more administrative things. Issuing solicitations to pick those focus areas. Establish, you know, doing the organization required for PAC meetings and the minutes of the meetings. Much more administrative, not expected to do research or you know, well that's basically it, not actually performing the research themselves.

MR. MINNICUCCI: So basically the

Program Administrator is really the administrative function and the Focus Area Lead would be more the technical leadership for the program, is that right?

MS. TEN-HOPE: Right, and the area they probably both have some responsibility is making sure that the work gets to the market, gets used, is well marketed with good information and technology transfer opportunities that they're leveraging opportunity. So there would be some responsibility at that highest program level within both of them.

MR. MINNICUCCI: And then the technical advisory committee would support the focus area lead as needed on a technical basis?

MS. TEN-HOPE: Right, they'd be providing input more on the technical level, whereas the PAC would be more strategic guidance on the overall transmission research program.

MR. MINNICUCCI: Okay. I need to digest a little bit more, thank you.

MR. FIGUEROA: Al Figueroa from ESC Solutions Consulting. I think the -- as a first cut, the approach that you're proposing in here is the right way to go. Obviously as you move

forward into the implementation you're going to be able to fine tune the process and identify whether there is going to be one, two, three focus areas and how to best manage that.

Particularly to the skills of the Program Administrator, I would suggest that certainly they would have strong managerial and negotiation capabilities. Especially experience with contracts with the Energy Commission in that range. They are going to need strong management and some strong high level technical advisory capability, I think would be essential to that kind of entity.

In addition, I think they should also have good relationships with not only the -- or ability to build those good relationships with the Energy Commission, the PAC and the implementors of the programs so as to make these successful events. I look forward to hearing some more about it and sure would be interested into the process of administration. Thank you.

MR. HAWKINS: Dave Hawkins, CA ISO. I like the structure and it reminds me of the old saying, fail to plan or plan to fail. And what this looks like is you really have them putting in

place a organizational structure that basically executes the kinds of plans that we were talking about throughout most of this day.

The thing I would look for them is two things. Number one, to ensure that there is a lot of flexibility and nimbleness as the structure is put together. Because as we've identified, opportunities or things that really need to be worked on, that we would not have a two or three year approval process to get it into the plan, but there would be nimbleness and a way to get those things into the program and get them addressed.

The other issue is looking at the CEC and upward is that certainly it seemed to me the CEC has a relationship also to DOE for co-funding from the federal level and it's vital, I think for California to try to attract research dollars from the federal as much as possible to help these programs.

In addition to that, it seemed like there is also a scanning role that the CEC would play that would look not only throughout the nation for other technology research areas, but also wed continue to look internationally as we look at similar type companies in Brazil and in

Europe and other areas that are also developing wind generation, and other -- addressing transmission type issues. So it seems to me the CEC has an outward looking role, as well as a internal management type role.

MR. MCLANE: My name is Tom Mclane, I'm with Applied Technology Council. I had a couple of questions. The first one was, on the organizational chart you put up. I didn't see clearly where the contractors were that we're going to be performing the research projects and who they would be reporting to? I assumed they would be reporting to the focus area groups, but maybe there needs to be some more boxes added on there.

And then what's the relationship between the TAC and the Focus Area Lead was to the entity that was conducting the research? So that was one comment. The other one was, what does the CEC envision as the process for selecting the Program Administrator? Is there a process that has been thought about? What's the timing on that? That's all I have, thank you.

MS. KELLY: We don't have -- we haven't decided on anything at this particular point.

Whether you're talking about whether there would be a solicitation for the program, we haven't made that decision at this time. But we will talk about that and decide how we'll go on that.

MR. MCLANE: Do you have a timeframe for making that decision?

MS. KELLY: Well we are looking to have the work done, you know some time in May. And I would assume some time after that we would, if we have a transmission plan and a budget, then what we would be doing is developing and finalizing an implementation plan.

MS. TEN-HOPE: In the summer time frame between -- I mean, we have some decisions to make after this meeting in terms of the research assessment and implementation strategy. So the next couple months.

MR. MCLANE: Thank you.

MR. ALVAREZ: I'm getting confused here. Manuel Alvarez; Southern California Edison. I thought I had an understanding, but maybe I just need some more explanation? I guess when you look at the focus areas, you're seeing and individual and organization that is not doing the research or doing the activity, so there is another group of

people below that that are actually doing the work? So you have the researcher, then you have the focus area organization, then the administrator? So you have two groups between you and the researcher?

MS. TEN-HOPE: We didn't see the Program Administrator doing the research.

MR. ALVAREZ: Right, okay, I understand that.

MS. TEN-HOPE: The Focus Area Lead, that could be a team of, I mean it could either be a team of researchers managing an overall portfolio of projects, or it could be more of a prime that had a series of research performers underneath. It sort of depends how big is that scope of how many projects are there? Is there a team going to come together with all those projects? And then where do you go forward? You might have your first year of projects, but year two, you're going to want to populate with new projects that may not all be within that original team.

MR. ALVAREZ: I guess just one point of caution, I guess, is I'd be concerned a bit about having the Program Administrator, you know, basically utilizing funds for administration and

then you'd have a third, another layer of management or administration before you actually get down to funding a particular project.

But I guess if you, if conceptually your seeing that as somehow they come together and they both do the work and manage themselves, I guess, I guess that would seem okay. But I just want to put that caution out there. I don't think you want to see two levels of administration, one at the Program level and then one at the Focus Area level that's not doing the work.

MR. COUNIHAN: Hello Commissioner Geesman, Commissioner Rosenfeld and Ms. Kelly. My name is Rick Counihan and I'm with the Electricity Innovation Institute. Ms. Kelly could you put up the diagram again? Because I think that's really useful. Basically I think the structure is a very good one. I see two potential strengths of it. One is that in a time of reduced employee slots here at the Energy Commission, it allows you to get more reach with your R&D money with the same number of staff people.

The other thing is, I believe that this structure also helps you ensure strategic integration across the focus areas. Because as we

listened to in the technical discussion earlier, there are going to be issues that cut across all of them. That you want a hardware to be able to talk to the software and you want to have the right sensors. And the operations have to go correctly with the hardware, so I think this structure that you propose gives you an opportunity to have that strategic integration.

I think you also need integration, however, with activities that are going on in transmission outside California. And one way to get that, I think there is a couple ways to get that. Over there in the Policy Advisory Committee you have the U.S. Department of Energy, I think that's a good thing.

And then that can help make sure that what the CEC does is not duplicative and is complementary to what the U.S. Department of Energy is doing. And they have just, your timing is perfect because they've just started up a new office of transmission with Jimmy Gladfelty heading it up. And so doing this right now when he's about to go into the same kind of process in a couple of months, I think your timing is perfect.

So you do need to have that coordination. And i think the Program Administrator can also help you with that, seeing what other people are doing outside as well.

I think the PAC is very, very important. And so are the technical advisory groups down there. And I'll talk a little bit more about each of those. But I would note that this is roughly the same structure that we use at the Electricity Innovation Institute for our large projects.

We always have an advisory committee as well as technical advisory groups, we call them groups for each of our projects. And the people in the PAC can really give you the advice that you listed with your bullets there. They can also, I think, help you with coordination elsewhere. But that makes sure that you're -- I mean if you have the California ISO, the California Utilities, the CPUC, you'll be pretty confident that your program is meeting the needs of California.

The technical advisory group in our experience has been invaluable. Not -- in our experience, those have typically been people who are middle management with a lot of technical expertise. And they've been really helpful to us

not only in the bullet points that you had cited, but also in reviewing RFPs. For example if one of these areas is going out for an RFP, you need people to not only help you form the RFP, but then to do the review.

And I know, any of you who have been in any of those RFP review processes, it's a boat load of work. And so having those people, and they could come from the same agencies. In other words, you could have a Senior CAL ISO person on the PAC and then they designate four different people on different TACs depending on their technical expertise. So I think the structure of those TACs is really important and I applaud that you have that.

A couple of comments on roles and responsibilities. I think the administer should be a little bit more than pure administration. They need to have knowledge of the area, transmissions area. And the reason I say that is that, they don't have to be the world's experts.

You want the world experts actually doing the research work. But you need to have enough understanding of transmission so that they can understand where the seams are between the

focus areas and are conversant with some of the people outside of California who are also doing work. So they can help provide feedback to you.

Also, I think, well, stick with the Program Administrator for a moment. So they need to have working knowledge of transmission, proven ability to administer complex programs. Also, the ability to work with and understand the PAC.

Because what I suspect will happen here, is that CEC will invite the members of the PAC, but actually conducting the PAC meetings will probably fall to the Program Administer. And therefore, they need to be able to talk to people with both a public policy bend and a technical bend, and understand the policy drivers behind those people so that you get the highest quality interaction for those meetings.

Now maybe I'm wrong, maybe your going to have the CEC staff do that. But I think if you're going to have the Administrator do that, they need to have that kind of ability.

You need to have contacts with other people nationally and want them to have the ability to pull together technical reviews as necessary to review anything going on down the

line. And that might be, you know, bringing in international people or national lab people, or whom ever is appropriate for the particular structure.

Anyway, I think it's a good structure. I think some of the previous commentors have raised some questions, good questions. But I think in general, I think that's a very good way to go.

MS. KELLY: Thank you.

MR. COUNIHAN: Thank you.

MR. HOPKINS: Randy Hopkins with PG&E. And I'd like to say first, that I think this framework is a very promising step forward. I think framework is very similar to what we're currently using with the CEC and Cal Trans with the Lifeline Seismic Project. It shares many components in common. We find it's a pretty successful implementation model for us. It adds a lot of user-driven capability to it.

One of the ways in which is differs, or appears to differ from the Lifeline Seismic Model, is that in the Lifeline Model there is a joint management committee that selects the R&D projects based on a consensus process. That appears to be

missing in this. It appears that the CEC will be solely selecting the projects as opposed to taking, and maybe I'm wrong about this, significant input from the PAC.

I think you may want to consider the model where you have some sort of input from the PACs in selecting the actual projects. Those utilities and those regulatory agencies that are there in the PAC are on the front lines in terms of operating experience and so they see a lot of the problems and the needs that come up.

And to the extent that there may be a perceived if one of the entities there, the ISO or the utilities on the PAC were to actually submit for an RFP to do R&D, I would think if there's a perceived conflict of interest, then maybe that party could recuse themselves in that selection process. I would encourage the CEC to look at utilizing the full capability of the members in the PAC.

MS. KELLY: Thank you.

MR. MINNICUCCI: I'm back. John Minnicucci; Southern California Edison again. In looking at the Focus Area Leads and trying to understand how everything integrates. Is there

some type of mechanism for a feedback look between all of the areas? I mean is there some type of, do you foresee some type of symposium or some way across all of these areas that we'd have like a clearinghouse, or something to that effect?

MS. KELLY: I think --

MS. TEN-HOPE: I'd answer with yes.

MS. KELLY: I just was going to point out that all IOUs do go to the Program Administrator.

MS. TEN-HOPE: I think you're -- I mean that the need for technology transfer, sharing the results among key stakeholders and anyone interested in the public is really important. And where that's, you know, whether it's done within each focus area or between the focus areas is, you know, that's a good question. And, you know, part -- I was almost going to ask a question back, because one of the comments this morning was concern about these focus areas and needing to integrate across. And what kind of structure or mechanism best facilitates the integration between those programs, so you are sharing research results if it might be really relevant for someone in Focus Area 3 to know about Focus Area 1.

And you know, if you have thoughts you want to submit that you think would improve that, that's sort of a level of detail not fully embedded in this.

MR. MINNICUCCI: And I wouldn't expect that level of detail. It's just that, you know sometimes when you look at the success of a program or any, you know, strategy, it's all the devil is in the details. And I for one am very excited with the potential here.

I did have one other question. Would you see it as being a conflict of interest if the utilities collectively were a project, or a Lead in one of the Focus Areas? And I'm looking at more of a team approach rather than just having one group. But, I mean, we're represented on the TAC and the PAC and all of that. I'm just, you know, is there an opportunity for the utilities to do actual research in this model?

MS. TEN-HOPE: I think you'd need to put forward more of what this full model would look like. And then it's easier to address the question of conflict of interest. I mean, obviously utilities are a key stakeholder. Where are they? Are they everywhere? Are they at PAC,

at the Program Administrator, at the Focus Area and doing to research, and on the TAC?

I mean, there is some, are you envisioning all those roles? Or the role of a Focus Area Lead and so if you could sort of thing through what that model might look like, then we could look at the question of conflict.

MR. MINNICUCCI: I'm really excited about the fact that we collectively have input and that, you know, I see a great possibility here for transferring technology and actually working together. It's pretty exciting. Thank you.

MR. CORLETT: Jim Corlett; San Diego Gas and Electric. It's great to be here. I like your model for the most part. I have some questions as far as definitions, maybe if you look at the PAC and you look at the TAC, on others. What are your thoughts in terms of who others might be?

MS. TEN-HOPE: Do you have any suggestions?

(Laughter)

MR. CORLETT: No, I'm just, just questioning that, at this stage you're just leaving it open at this stage?

MS. TEN-HOPE: I think it's important, I

really don't, I don't have an answer at this point. I think it's important to go back to the criteria and the, you know the strategic guidance that we'd look for. The leveraging ability, you know, what Focus Areas have the priority? It's been commented that perhaps there ought to be -- the environmental community should be represented in the PAC. That could be a consideration. And really open to suggestions on what balances those functions most appropriately.

MR. CORLETT: And I can say that PG&E, SCE and SDG&E are pretty much in line with much of this. We've discussed this in the past. But I did also want to kind of agree with John from SCE in terms of, we would like to be part of a lot of this. In other words, we see we're in the TAC box and in the PAC box, but there is still interest within the utilities to do actual projects and research as well. And we'd like you to try to, if there is a way we can work that in without any kind of conflict of interest, we'd like to participate in as many areas as we can.

And then the other thing I would, just a question to think about, I guess, for everyone. I guess I'm a little concerned as far as the

administrative cost associated with doing Focus Area Leads in addition to the Program Administrator. And maybe there would be a way to combine those more than have them separate. It may save some costs as far as, you know, getting the most bang for your buck on projects to the marketplace.

So I just question that and ask that that be looked at a little more. It may be that you don't need focus area leads and that there would be a way that the Program Administrator could handle those functions as well. Thank you.

COMMISSIONER ROSENFELD: Laurie, I can answer your question on this possible conflict of interest. You've had lots of projects with utilities before?

MS. TEN-HOPE: Uh huh.

COMMISSIONER ROSENFELD: So you have some experience about handling questions where the researcher is doing the research, but the utility is on the PAC, so you've done that before, right? It can be done?

MS. TEN-HOPE: We have many projects with the utilities as the researcher. But the program doesn't currently have a PAC or a TAC.

COMMISSIONER ROSENFELD: Oh.

MS. TEN-HOPE: So we're not getting advice from the same, you know, writing the solicitation or providing the issues from the same organizations that are performers. So it's going to be something for us to work through in this model.

MR. FIGUEROA: Al Figueroa again from ESC Solutions Consulting. The PAC actually takes a form somewhat to what we used to know as the CURC, or the California Utility Research Council. In which the Energy Commission, the Public Utilities, the IOUs, the other utilities in California, ISO and I believe NDOE was at one point involved, in which there was a very collaborative process for evaluating the research projects across the utilities and so as to avoid the overlap. And if there was an overlap to try and coordinate that. So that served as basically the method of technology transfer.

In addition to that we held workshops and annual meetings or so to collaborate to bring that up and encourage that information to come out. And then have additional collaboration with implementors for particular projects or

particularly technologies and systems that were developed as part of that process of the research that was going on.

So I think I see that entity as perhaps something similar to that in which perhaps the administrator -- could we go back to the chart please? Where the Program Administrator could very basically then administer that concept of organizing the CURC.

The CURC used to have a person from each IOU in California be the chairman, you know, it was a rotation of every four years. Instead, a more steady type of activity would be that the program administrator would be that role and it would in essence be coordinating and functioning as the chairman of that group. And then organizing and orchestrating with the PAC to understand the elements of organization, strategy and implementation.

And then to bring in the other entities of the actual work that's being conducted, hold those workshops and organize those workshops and annual meetings as to try and transfer that knowledge base across the researchers, the utilities to try and implement.

And that's another aspect of the concept in here, is that you want to encourage in this process the implementation of technology. And that's going to be by the utilities. Because if they don't implement then you can research things all you want. If there is no implementation, there is no benefit.

So and certainly I think I've heard a couple of comments with respect to the cost issues. That you don't want to have a lot of overheads or a lot of costs in administration. And so this team that you might want to have as Program Administrator, you might want to have something that is fluid and flexible in administrating with strong administration skills again, coordination activities and so on. But to be low overhead and cost effective entity that would be able to manage that kind of process.

MS. KELLY: Are there any more question or any more comments. I think that one thing that we, you know from listening to the comments, the big challenge is finding these entities that have all these characteristics that everybody mentions. They should be cheap, they should be comprehensive and know everything.

(Laughter)

MS. KELLY: And so I think we all understand it's going to be a challenge to find the right people. And the more we can pack into one of these, you know, these entities all these things that you mentioned, I think it's clear that the cost will be lower. So if we can find the right people for these various roles it will help us all. So we'll look to your input.

Commissioner Rosenfeld and Commissioner Geesman do you have any final comments?

ASSOCIATE COMMITTEE MEMBER GEESMAN: That's my cue.

(Laughter)

ASSOCIATE COMMITTEE MEMBER GEESMAN: Just with respect to the last discussion, let me say that it certainly strikes a responsive cord in me that we ought to make certain that our administrative costs are kept to a reasonable minimum. And that we avoid as much as we can paying overhead on top of overhead.

I'd also like to make certain that going forward we do figure out a structure that makes appropriate use of the utilities input throughout the process. And that we structure that process

so that that input from the utilities be as effective as it can be. And I don't have a pre-judgement now as to know what mixture of implementor, PAC member, TAC member, researcher really optimizes that.

But this program won't be successful unless we're successful in figuring out an appropriate way to take advantage of the many opportunities that the utilities present to us. And I say that both with respect to the Investor Owned Utilities and the Municipal Utilities.

This has been a good listening day for Commissioner Rosenfeld and I. We haven't said very much. We'll have more to say later as we've had a chance to meet with the staff and go over the results of the day and review their response.

What we intend to do is take under advisement the public input from today's Workshop, as well as any written comments that are submitted. And i really want to emphasize the value of written comments. We do read them quite carefully and sometimes we read them several times over.

I'd ask you to have those to us no later than March 19th if we're to stay on our schedule

we need them by March 19th. The two consultant reports will be finalized by April 15th. The Staff will develop a Draft Transmission R&D Plan in May. The R&D Committee will establish a budget recommendation in May. Hopefully at that point in time be able to finalize the Commission's R&D Transmission Plan based on that budget.

So our hope and expectation right now is that within another 60 to 75 days we will have an R&D Plan for the transmission area that encompasses a five-year time horizon.

And I want to thank you all for your input and participation today and invite it on a continuing basis going forward. Thank you.

(Whereupon, at 3:40 p.m., the Workshop was concluded.)

CERTIFICATE OF REPORTER

I, PETER PETTY, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission Workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said Workshop, nor in any way interested in outcome of said Workshop.

IN WITNESS WHEREOF, I have hereunto set my hand this 4th day of April, 2003.